Seeing sanitation:

a social scientific account of Christchurch's post-quake sanitary infrastructure.

A thesis submitted in partial fulfilment of the requirements for the

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Acknowledgments

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Abstract

This thesis is about many things, not least of all the September 4th 2010 and February 22nd 2011 earthquakes that shook Christchurch, New Zealand. A city was shaken, events which worked to lay open the normally invisible yet vital objects, processes and technologies which are the focus of inquiry: the sewers, pipes, pumps, the digital technologies, the land and politics which constitute the Christchurch wastewater networks. The thesis is an eclectic mix drawing together methods and concepts from Bruno Latour, John Law, Giles Deleuze and Felix Guattari, Nigel Thrift, Donna Haraway and Patrick Joyce. It is an exploration of how the technologies and objects of sanitation perform the city, and how such things which are normally hidden and obscured, are made visible. The question of visibility is also turned toward the research itself: how does one observe, and describe? How are sociological visibilities constructed? Through the research, the encountering of objects in the field, the processes of method, the pedagogy of concepts, and the construction of risk, the thesis comes to be understood as a particular kind of social scientific artefact which assembles four different accounts: the first regards the construction of visibility; the second explores Christchurch city from the control room where the urban sanitary infrastructures are monitored; the third chapter looks at the formatted and embodied practices which emerge with the correlation of the city and sanitation; the fourth looks at the changing politics of a city grappling with severely damaged essential services, land and structures. The final chapter considers how the differences between romantic and baroque sensibilities mean that these four accounts elicit knowing not through smoothness or uniformity, but in partiality and non-coherence. This thesis is about pipes, pump stations, and treatment plants; about the effluent of a city; about the messiness of social science when confronted by the equally messy world of wastewater.

Introductions

I didn't know what to expect as I pulled into the car park. Even before I start walking across the tarmac I could see a figure smoking at the entrance, sitting on the railing attached to a short set of steps leading up to what I assumed to be the control room. Being tall, this man was easily positioned, a pose of regularity, of familiarity, even a hint of ownership. 'I'm here to see Jack' I said. 'Me', came the somewhat gruff, smoke encircled words of this perched figure. A cigarette butt disappears somewhere and we shake hands in an obligatory manner. My hand meets a strong, rough grip. My eyes meet a shaved head, goatee beard, a red check shirt, dirty jeans and worn work boots. Middle aged, towering over my own average height frame. My ears are introduced to a strong throaty voice suggesting that smoking is not a habit but a cherished lifestyle. We proceed inside, entering through a small cafeteria, to the left a kitchenette with coffee mugs and tea towels, to the right dusty chairs and a couple of tables scattered with a day old newspaper.

When I said I didn't know what to expect I was mistaken. I did have a vague mental picture of what I thought this person and this control room would be. I expected to meet an engineer perhaps, someone polished. A clinical control room; purposeful and important. It could be said that there was a quality to this scene that I did not expect, a humility which showed itself in the dusty chairs with torn edges, and in the pieces of frayed duct tape used to secure computer screens to their supporting wood laminate furniture. The centre of the room has four large screens set onto the wall just above the windows overlooking the entrance to the plant. These four screens are constantly flicking through real time images of the comings and goings of the various entrances, exits and corners of the treatment plant. Set out across the span of the control room is a layout of narrow office furniture which house numerous computer monitors forming two multi screened work stations, attended by bodies and faces directed toward these screens, the windows, and the large surveillance screens above. The room is not cramped, but it feels long, sideways long.

The far side opposite the cafeteria is the door leading out to the treatment plant where the effluent, the murky detritus pulsating from all corners of the city, from every household, from toilets, dishwashers, washing machines, tubs and sinks, and all manner of commercial and industrial waste, pours through the underground gates at an average flow of 172,000 metres cubed per day (CCC 2012).

From laterals to catchments, to trunk lines and rising mains, hidden underground, with 120 pump stations scattered throughout the area, by gravity and by pump, effluent is progressively funneled through five terminal pumping stations, toward the treatment plant. Here the liquid waste is hungrily received, pushed through a vast array of sieves and screens, sedimentation tanks, clarifiers, trickling filters, odour control systems and 230 hectares of oxidation ponds. Through mechanical, biological, and hydrological processes, solid and liquid are separated, particulates extracted, harmful organisms neutralized, bio-solids dispersed back to the land. The liquid is expelled three kilometers out to sea. Ashes to ashes, dust to dust, water to water. The ocean outfall station is a fitting technological farewell, an architectural outpost standing seemingly alone on a thin borderland of the formed land of the oxidation ponds and the estuary's edge.

The treatment plant, although important, is a minor participant in this thesis. I am conforming to a separation which has been made by those that govern these processes. The surveillance of the treatment plant is one half of the control room in which I undertook some of my fieldwork. It is this second bank of screens that the on-duty plant engineer observes the functioning of the treatment processes. This surveillance is different from that of my contact (the shift controller): the plant engineer spends much time away from the seated observation post working out in the various parts of the plant which require work, closer inspection, tinkering, and expertise. The shift controller however, is responsible for the reticulated supplies, the 'essential services' vital to the functioning of the city - the continual flows of the water, sewerage, and gas networks which span the entire space of Christchurch – that which occurs 'outside' of the treatment plant. The responsibility for reticulation demands constant attention, a vigilance which requires an embodied presence before screens.

'*This*' the shift controller motions, '*is the city*.' My vision is directed toward liquid crystal displays, screens that widely encircle the controller, positioned so that one person can 'dominate at a glance' the numerous flows of data. These screens display words, numbers, lines, diagrams, versions, depictions, representations, reductions, and particular descriptions of movement and flow. I will be introduced to 'the city' in a number of ways over the course of my fieldwork exploring the world of 'wastewater'; the effluent, the liquid waste of a city, the under and over ground, material , technological, political, organisational and social worlds of the movement of waste and the land in which this is embedded. These flows of effluent, of data, of life, of images, are real versions of what is Christchurch City, a term that does not necessarily or directly correlate to a region or a political boundary. From the vantage point of the world of wastewater much of what is referred is obscured,

hidden, *and invisible*. Invisible in two different ways: in the sense of being taken for granted, being mundane and common place, unconscious; invisible, in the material sense engineered away, out of reach of the senses, closed off, restricted, underground. These infrastructures, objects and flows are ever present in the commonplace practices of citizens, yet the forms of conduct and the politics secured through these objects of sanitation are imperceptible, buried in land, in temporalities and histories. The vastness, the complexity and the invisibility of such networks requires following how the work done to secure, maintain and see the city also enacts the city as a political form. The mundane, the naturalisation of sanitary sewers and the urban infrastructures which constitute this 'invisible underground city' are temporary. The black boxes of urban infrastructures are shaken open, settled objects ruptured with the very earth. The September 4th 2010 and February 22nd 2011 earthquakes, the 'Canterbury earthquake sequence' literally brought to the surface the objects, the politics, the practices, rendering visible and reconfiguring the city. Temporalities are exposed and controversies multiplied, provoking political differences over how the city should be reassembled.

You have met some of the participants; the shift controller, the treatment plant, the sewer network, and the earthquakes that disrupted these things. We will come back to these. But before going any further let us get some niceties out of the way. I welcome the reader. I imagine you are sitting down, maybe with a cup of tea or coffee. Settled in your seat rather than perched on the edge I would hope, prepared to read with some amount of interest. It is said by many that it is not the destination so much, but the journey that is important. I would urge you to bear in mind, that the journey through this document for you the reader is vastly different from the author. Rather than a shameless attempt to elicit some benevolence on your part, I am trying to suggest that this document is a temporary mediation between multiple worlds. It is an effect, which speaks about an object, or series of objects, assemblages, processes, rationalities, politics, concepts, observations, even an educational system. It is also unfinished because it awaits a grade, an assessment. To the student these are the horror like visions of the red pen's condemning strokes and scrawls, seeking to rearrange, add, delete, tear apart what is very temporary, yet painstakingly, crafted. It is the great fear of reduction, to reduce it all to a word, a grade, before it is cast off into the dusty world of the shelf, the land of the unread.

It is often said that seeing is believing, that is, in order to ascertain the reality of phenomenon, it must be evidenced through the senses, experienced empirically, often privileging vision. This thesis focuses on Christchurch's sewer network, a physical network that over the course of the fieldwork became increasingly difficult to observe. Despite the very materiality of this infrastructure being often

obscured, tracing this physical network led to multiple networks which stretch beyond the static visions of objects, buildings and space. This often led to questions regarding how to follow and how to observe and describe such networks and connections. This thesis, then, is about sanitation, about sewers, about the city, it is also about following how things are made visible; the multiple and diverse processes of seeing and describing a phenomenon. Seeing is a process requiring both description and a conceptual vocabulary. Making things visible is not necessarily done with the eye or the primary senses alone. This thesis is about loss and gain, about scales and visibility, and about the messiness of social science when confronted by the equally messy world of wastewater.

My intention is to convey that what is being read as a thesis is an artefact, a social scientific artefact that intertwines an ensemble of incommensurable actors. It is a social science laboratory in which diverse phenomena are brought together and transformed into inscriptions; objects, observations, and controversies, transferred onto paper. This is my laboratory, part of the research process which often escapes any description or explanation, a laboratory that I, myself, am both 'author' but also participant. How do I describe the effects of this laboratory? What are the objects and processes and happenings which transform vastly different and incommensurable objects, things, artefacts, ideas, beings, into words, sentences, narratives, inscriptions? For the social scientist, at least for this one, this is a significant part of the journey, a central element in the constitution of visibilities in social science research.

To read and ascribe a grade are (to a large extent) foregone conclusions, and in this sense you are already a part, but only as a far-off figure involved in a trial of strength, part of a collective which together with course requirements, marking schedules, supervisory responsibilities, EFTS's and academic knowledge, assigned the task of marker. I apologise if I have already reduced you, the reader, and hence I now extend an invitation, with open arms, to welcome you as part of my thesis, into this very discussion, a discussion that is impossible without you. So in your hands, on your desk, or as a file on your computer, you have an artefact. Because it is in your possession it is already beginning to morph, to change, to be added with ever more entities, cascading, hurtling toward the artefact, pulsing through it, electrifying it, moving, negotiating, configuring, resisting. It is indeed a journey; one which folds the past, present and future together, one in which the human actors are incommensurable or irreducible. Surrender, even if it be for just a moment, your red pen, refute your reducibility and embark with us, take up the invitation to be part of this thesis, this discussion. It is only polite that you accept.

Chapter 1

How things are made visible

1.1 Approaching the field

Evident from the introductions, there is not one but many objects in this account. The second point to be made is that of these objects, many are difficult, if not impossible, to directly observe. A wastewater network spans a vast area, with much of it buried underground. Earthquakes again, are seismic waves pulsating through the ground, a phenomenon that can be detected only very locally and generically through the senses, to varying degrees made knowable through scientific instruments, but evidenced most directly through the physically damaging effects on the environment around us. In the case of Christchurch's sewer network, the effects of the earthquakes are considerably harder to ascertain. In the case of storm water and wastewater, the damage sustained to pipe work underground is ascertained through 1) the taking of levels between manholes and 2) through actual CCTV footage of the pipes. The former method enables an estimate of the gradient of the particular section, important for wastewater because the majority of pipe work in Christchurch works on a gravity operated system with less than 10 percent of these pipelines being pressurised. The fall or gradient of the pipes therefore is essential not only to the actual movement but also importantly the rate at which sewage moves through these pipes. The earthquakes have disrupted approximately 300km of the wastewater pipe work. Included in this damage is the reduced or reversed gradients (of which Christchurch's gravity system, due to the terrain, is already flat), meaning a significant portion of the sewers rely not only on the integrity of the pipes, the structures themselves, but also the very earth, the trenches in which they are buried. The latter method involves the operation of CCTV mounted buggies being fed into pipes and drains line by line (figure 1) in order to identify where and to what extend each section is damaged.

Figure 1: *Examples of actual storm-water pipe CCTV footage June 2011*

But this is not primarily or singularly about earthquakes. To some degree, although they are of no less importance, the earthquakes were incidental. However, of importance to this project is the work that goes into making things visible: making visible a city and the infrastructures that have been shaken and disrupted by multiple earthquakes in 2010 and 2011. It is this 'city' that I was introduced to in my very first few moments of fieldwork, which has become a short-hand for the vast but often invisible objects, processes and work that is done, not only to render visible, but to make, a city. Pointing to the work of making a city visible elicits pause for this very project. The nature of fieldwork in this research has been characterised by efforts regarding how to see the objects under investigation. This has been the 'work' in fieldwork: striving to make things visible, where much had to be done to in order to render aspects of sanitation not only visible in the physical (and empirical) sense *but visible sociologically*. The earthquakes participated as a fellow researcher, their thundering voices constantly and violently causing the 'city' – at least the city observed from the control room - to be unearthed in the material as well as the processural, and visible through the ongoing controversies surrounding the reconfiguration of the ruptured sewers and urban infrastructures. In areas most affected, such as the eastern suburbs of Christchurch, the city of the screens was literally turned 'inside out'. Disruption to Christchurch's urban infrastructures, and particularly the severely damaged and altered form of the sanitary sewers afforded an otherwise impossible vision which also, often, altered the trajectory of my own work investigating these objects.

John Law (2004a, p.2) asks: how might method deal with mess? What happens when social science tries to describe things that are complex, diffuse and messy? If I were to construct a conversation, Latour may answer ('with a nonchalant shrug'): 'just look at controversies and tell what you see' (Venturini 2009, p.259) that is, just observe and describe (Latour 2005b). And herein lies the problematic: observation is a process, a point emphasised because much of my object of inquiry has been difficult to observe directly; and describing, no less difficult because there is little to no language by which to describe what exactly I am looking at. Certainly sociology could be considered, at best, rather ambivalent toward sanitation networks; time and again I would be asked by colleagues, often with befuddlement, 'you mean the *social effects* of wastewater?' My answer was always a tentative No. It is neither the 'social' nor the 'effects', as intended in this question, that I have been necessarily trying to observe and describe. The damage and failure of urban infrastructures, following the September 4th 2010 and February 22nd 2011 earthquakes particularly, generated a very explicit agency of these objects and their role in the co-production of the 'social' and the 'city'. As Law and Bijker

(1992, p.290) state: ‘Purely social relations are found only in the imaginations of sociologists, among baboons, or possibly, just possibly, on nudist beaches...’. To focus on the ‘social effects’ is to locate the very objects involved in wastewater outside of the ‘social’. This is ‘an empty claim’ (Callon & Latour 1992, p.361) which does indeed ‘distort into clarity’(Law 2004a, p.2) an object, a great many objects, the phenomenon of sanitation, of sanitary sewers, a city. This phenomenon is something that is far too complex, dispersed, active, and essential to our lives to be reduced to an effect that can only be registered in the abstract realm of pure social relations.

The focus for this research has been to observe and describe the phenomenon of ‘wastewater’ – and in particular the system of infrastructures – here meaning both the physical objects and the political relations within which Christchurch’s sewer network is associated. But where to begin? To explore wastewater means traversing a terrain of many different objects, processes, things, dimensions: it is a physical network of over 1700 kilometres of pipe work, 120 pump stations, 33 odour control sites; it services towns and suburbs beyond the regional boundaries of the city (CCC 2012); it is interconnected with water, storm-water, electricity and maintenance infrastructures, it is constituted by a mixture of both public and privately owned organisations that are vital to the continued functioning of city-wide sewage removal and treatment. It involves the physical circulation and flow of effluent and clean water; it is the flow of finances such as debt and funding for the improvement, construction and extension of these infrastructures, part of which is implicated in regional taxes, rates and financial planning. The physical wastewater network is a series of ‘assets’ valued at over $1 billion NZD, with 9.7 cents out of every dollar raised through rates being spent to maintain the sewage collection and treatment (CCC 2011c).

The collection and treatment of effluent is part of a mode of local government, connected with acts of parliament and legislation such as the local government act 2002 and the resource management act 1991, which designate legal and political responsibilities regarding the management and the design considerations of these infrastructures. Sewers, of course, also connect populations, serving over 146,000 households with 86 percent of sewage being generated domestically (CCC 2012). The objects and the many processes of urban sanitary infrastructures mediate and enable the very intimate and everyday sanitary practices of our lives. Much of this, although ever present and seemingly ‘concrete’, is also simultaneously buried underground, set on restricted sites, monitored, managed, compiled and designed in offices, with diverse and often hidden processes that are vital to the ongoing and uninterrupted functioning of these ‘essential services’. A significant aspect of the reality of the

wastewater network is invisibility; not only in regard to the fact that it is engineered out of sight, but more-so, through infrastructures such as sewers that remove and make invisible the production and flow of detritus, the liquid waste, the effluent which is generated and flows through and around the city. The focus of this research therefore, is not just to observe and describe Christchurch's sewer network and the post quake controversies that surround this phenomenon, but to engage with the process of *how to go about observing and describing* such a vast, variegated and complex phenomenon.

1.2 To observe...

What does it mean to observe? Or more accurately, what does observation mean to the social scientist? Such a question has become core to the methodology of this project precisely because the focus is to investigate something that is, to begin with, primarily understood as a physical infrastructure. Physical objects, it could be argued, are easier to define and observe than the more abstract notions of social relations and social effects. The links between physical objects seem to be far more explicit and empirically obtainable. This argument, however, is misleading because first of all, as mentioned, many of the objects (and the processes through which they are sustained) that physically constitute sanitation are buried underground, on restricted sites, and cover a vast area. A sewer network, although a physical reality, is impossible to observe in its entirety without the particular assemblage of screens and communication links that are assembled in the control room. Observing objects, in this case, proved difficult because the closer I got to the 'things-in-themselves' (Callon & Latour 1992) - the objects, the technologies, to sanitation - the more they appear diffuse, un-stable, entangled, stretched and distributed across multiple worlds. They make it possible for me to relieve my bowels in private rooms; to flush a toilet, shower or bathe, cook a meal, make a coffee, or pay taxes. They contribute to the very the fact that our cities and suburbs are not swimming in water when it rains, let alone, thankfully, that we are not swimming in our own effluent. These possibilities are all effects - 'social effects' - they are the means by which our lives and by which cities such as Christchurch are enabled and mediated. In practice, the world of objects is not separate from the social world, there are no pure categories of objects on the one hand and people on the other, and certainly no clear division between such categories. Objects take on, but also allocate competencies; they participate in the constitution of, rather than sit 'outside' the social. This mediation, this active participation in the social is very much evident in the aftermath of the earthquakes where interruption

to the functioning of the 'essential services' of the city has become an interruption to the means by which populations are able to be, and remain, sanitary. This is not technological determinism, the objects themselves do not determine practices but enable possibilities, offer affordances, mediate, connect, but also transform relations. Sanitary sewers are particular configurations of objects, processes, and peoples: assemblages that are 'black boxed' (Latour 1999); meaning that the processes, the controversies, the politics, the work done to achieve these temporary stable configurations is hidden, obscured, and transferred into singularities - stabilised and settled objects and entities. Following the disruption the black boxes which are Christchurch's urban infrastructures are pried open, they are destabilised, erupting into multiple controversies. The very things which constitute sanitation are re-configured, added to, resisted, and re-worked continuously in order to stabilise the objects, the processes, associations which were quiet, mundane and, to a large degree settled, prior to the seismic disruption.

If I am to dissolve any *a priori* distinction between objects and humans, how then, particularly in the role of a sociologist, am I to go about the first half of the seemingly simple method of 'just look at the controversies and tell what I see'? Venturini (2009), in response to Latour, considers the 'just' in 'just look' as a highly significant methodological problematic. Before moving to how this problematic is integral to the question of observation for empirical sociology, I want to draw upon a distinction made by Andrea Brighenti (2010) between visibility and visuality: visuality pertains to vision, to sight, to gaze, to the relation between seeing and knowing, whereas visibility is 'a phenomenon that is inherently ambiguous, highly dependent upon contexts and complex social, technical and political arrangements which could be termed "regimes" of visibility' (ibid, p.3). However this distinction is not one that is made in terms of either visuality or visibility being qualitatively different in nature because they are inextricably linked to one another. Thus, visibility is important as a notion because it does not exclude sensory perception – it is inherent and vital to the process of observation – but also because it enables the simultaneous exploration of the social as a 'material and immaterial phenomenon' (ibid, p.5); a 'double vision' that attends, not only to what is and can be observed and seen, but also to the means and processes by which this 'social visibility' is constituted.

It is the inextricable linking of visuality and visibility that is vital to understanding the process and complexity of both the observing and the ordering of the object. The fieldwork in this research approaches sanitary sewers through the touchstone of empirical observation, through the realities of this vast and often materially constituted infrastructure. The fieldwork always began from objects, to

follow or trace networks (Latour 2005b), has taken a very literal tracing of the physical manifestations of the wastewater network. I sat for hours in the central control room where the city infrastructures are continuously monitored and operated; I toured the physical network of water and waste pump stations, reservoirs, wells, offices, the out fall station, and the entirety of the treatment plant; I surveyed damaged sites and reconstruction works; never separated from the objects, the things, that are sanitation. When up close, attempting to make this infrastructure empirically visible, the things-in-themselves become increasingly elusive, partial and dispersed. This is what it means to observe, to follow, to track, to trace: a form of method that more resembles that of a detective (Austrin & Farnsworth 2005; Lash 1999; Latour 1996).

What does it mean to be empirical in this case? Deleuze states: 'I have always felt that I am an empiricist, that is, a pluralist' (Deleuze & Parnet 1987, p. vii). The question of being empirical cannot be ignored when looking at the mode of observation within sociology. Deleuze brings this question into relief:

> But what does this equivalence between empiricism and pluralism mean? It derives from the two characteristics by which Whitehead defined empiricism: the abstract does not explain, but must itself be explained; and the aim is not to rediscover the eternal or universal, but to find the conditions under which something new is produced (creativeness) (Deleuze & Parnet 1987, p.vii).

I have attempted to use this definition as a guiding principal in the understanding of method, and particularly in relation to the role of observation in this project. Accordingly, to empirically observe my objects of inquiry means precluding distinct and *a priori* forms of knowing the phenomena being investigated. Preclusion, however, is not exclusion and this is what is meant by the equivalence between empiricism and pluralism: it is the observation of the states of things, which, in the process of observation, the possibilities of knowing are open. Phenomenon can be observed and described in a multiplicity of ways which do not begin with *a priori* distinctions, or prescribed methodologies. As Venturini (2009, p.259) states: '"just observe" does not mean that researchers are forbidden to employ pre-established theories and methodologies. On the contrary, not imposing any specific philosophy or procedures, the cartography of controversies invites scholars to use every observation tool at hand, as well as mixing them without restraint'.

I want to argue that sociology does not necessarily demonstrate this form of, or commitment to, empiricism, but offers rather, a set of methodological and theoretical tools which have already categorised the world that is to be observed. What sociology offers in this respect is not 'pure' observation, that is, the states of things are generally not seen outside the scope of what it means to be sociological. And this is the meaning of the 'sociological gaze' – to observe that which is abstractly known as 'society', the 'social', through the concrete, through the empirical sensibility. This is a particular regime of visibility, of social visibility which regards the processes and ordering of a method specific visuality. Sociology is a set of regimes of visibility through which social relations are rendered visible through methods, through ordering and through the manipulation of temporalities and scales. Sociologists can seemingly focus and refocus their 'lenses', moving across times and spaces, moving from what is categorised as 'macro' and 'micro', individual and societal, moving across histories and the present. Observation does not simply occur, it is a process, and one which includes, but not exclusively, the realms of sensory perception, as well as the material world, the means by which the observations are generated and described, and the concepts, ideas, indexes and theories which accompany observation.

It is this particular configuration of the empirical in sociology which demonstrates the interrelation of visuality and visibility that Brighenti (2010) describes. It can be claimed, for instance, that statistics enable a particular set of social visibilities: that numbers and patterns demonstrate society. It can equally be argued, however, that such visibilities are social scientific artefacts produced through specific apparatuses, methodologies, observations, practices, and inscriptions which ask questions, conglomerate, bring together, categorise, compare, measure, scale and define. Ruppert (2007) demonstrates that census taking, for example, exhibits a double identification process by which the subjects come to identify themselves through the census categories as part of the population. Moreover the state identifies the subject and is able to assemble populations through this process. Census taking brings into being a particular subjectivity that is configured in a number of different sets of practices. Of relevance here is the notion that the processes of making this visible - populations in this case, social categories and identities, through the practices of undertaking a census - significantly participate in the construction process. This demonstrates what Law, Ruppert and Savage (2011) term 'the double social life of methods'. They claim there exists a social life of methods, that social research methods are not simply tools for learning about the social world but devices that are 'fully of the social world that they research' and that they are 'fully imbued with theoretical renderings of the social

world' (Law et al. 2011, p.4). In this version of what Law, Ruppert and Savage refer to as the 'social life of methods' there is no divide between the world and representations of the world.

It must be noted that I have moved rather quickly and broadly from observation to empirical sociology to method. The purpose is certainly not to necessarily conflate these terms, but there is an intent to bring them closer together in order to resist a 'smooth' account of the process of observation and description. In regards to method, to the process of observation in this research, I want to take account of the 'social life of methods' which are a significant part of doing social science research. To put it differently: I want to describe (at least in part) the construction and apparatus that constitutes this particular social science laboratory in which 'social visibilities' are produced. That is, to bring attention not only to the object of enquiry, but to the ways in which this document, and the apparatus of the sociologist can produce particular ways of seeing and knowing such objects. Observation is part of a 'method assemblage' (Law 2004a) through which things are made visible: 'Method always works not simply by detecting but also by amplifying a reality' (ibid, p.116). What we know as method and what I am referring to as observation, is active. We are always detecting and rendering something visible through the processes of method, through ordering, through scaling and measuring, through reduction and amplification.

I have asked: what does observation mean to the social scientist? I have argued that for the social scientist observation is problematic, that it does not 'just' occur through the senses, but is a process. I have argued that 'traditional' sociology does not necessarily make the problematics of observation, that is, the interplay of visuality and visibility, explicit in accounts of society. In this thesis I am engaging with the process of observation, of detecting phenomena, of amplification, the processes of social scientific observation. I have also demonstrated a reluctance toward painting a smooth account of method. This is because, quite simply, method is not smooth or straightforward. Method in this research has revolved much around empirical observation, of following networks and traces. This has not been through the deployment of a generic set of techniques which enable the collection of data, but rather, took the form of an encountering: the encountering of the objects of inquiry which constantly generated questions regarding how to observe, how to 'apply' method, and the effects of this constant revision. Andrew Pickering (1995) gives this process a rather accurate description – 'the mangle of practice': a continual dialectic revision that occurs between observation and description, a constant moving from observing the object of inquiry and providing an account of these observations. Pickering is talking about science, about the dialectic processes that constitute observation in the

laboratory, in experimental science. I want to claim, if a little more modestly, that this work is experimental, that observation, method, my form of sociology, is an encountering, a mangle of practice. It is not necessarily any more haphazard or arbitrary in nature than conventional social scientific approaches. However, I want to demonstrate the social scientific laboratory, to let the messiness of social science, to let the processes of building visibility show through.

1.3 And describe...

It is prudent that description follows observation; that a distinction is made between these two forms in the method assemblage. Not that they are clearly separate but they reflect the two sides of the same coin. Where does observation stand without its counterpart description? A vocabulary, a means to articulate, is needed. If Christchurch's sewer system is my object, how am I to describe that which I observe? What language, what concepts, and what vocabulary do I draw upon in order to describe? As has been shown, Christchurch's wastewater network is comprised of many different objects and processes. It can be described in terms of a technical system, engineered objects, calculations and formulae, material properties, capacities and rates of flow. The language of engineering describes both the physical and material properties of the different but interconnected aspects of a sewer system including how to design, construct and maintain this network. Pipes and pumps are also translated into 'assets', they are drawn into financial flows, they feature in the setting and planning of city rates and operational budgets. Hydrology can describe the properties and movement of water and effluent, the 'natural' hydrological cycle which this urban infrastructure is designed to mediate, the flows, the rates and changes in infiltration and evaporation. Sewers can be understood in terms of their historical emergence, in terms of health and sanitation demands from urbanisation and industrialisation, or in terms of their requirements to support populations as part of an organised and governed city. Management plans describe the relations of finances to the objects which perform sanitation, how these 'assets' are monitored and perform, how they are scheduled for maintenance and replacement and related to the fluctuations and demands of populations and specific areas. These are all ways of describing the wastewater network, all of which are partial, and all of which reduce and amplify aspects in different ways. Such ways of describing infrastructures produce differing orderings and means of allocating and delegating competencies to all manner of actors, whether humans such as workers and managers, as well as the 'assets', the objects and things centrally implicated in the functioning of these networks. As mentioned, the term 'city' itself is a short-hand, as is the term

'wastewater network', which designates temporary stability to vast assemblages of heterogeneous entities.

I have been talking of observation within the context of visuality and visibility, and method as an assemblage: a bed of practices, techniques, concepts and processes which themselves participate in the constitution of the social, as they are socially constituted. The movement from observation to description, as above, shows that this is not an undertaking unique to the social sciences. Indeed, Latour claims that scientists only begin to 'see' when they 'stop looking at nature and look exclusively and obsessively at prints and flat inscriptions' (1986, p.16). Meaning that inscriptions - printouts, images, maps, diagrams, graphs, are ways to make scientific data visible, comparable, and mobile – they mediate and participate in enabling phenomena to be 'seen', to be observed. It is not necessarily the object itself, nor the mental capacities or perceptive senses of the observer which enable visibility, but the transformation of data into inscriptions - ways of making things flat, mobile, comparable - which contribute significantly to the process of visuality. For social science this involves the rendering of observations visible through inscription, but a certain form of inscription which involves description – the transformation of observations into words and text from what is empirically observed to what can be known, through a conceptual vocabulary.

In this sense, the social sciences are able to produce visibilities through a particular *a priori* ordering of what is relevant and what is to be observed 'sociologically'. Sociology is about the use of concepts most notably, that of 'society' and 'the social' (Gane 2004; Gane & Beer 2008). The use of such concepts tends to dominate the sociological approach towards empirical research. That is, relations between people are given privilege in a way which isolates the 'social' as a domain exclusive to humans and human interactions. The use of sociology to describe a sewer system would, understandably, use these key ideas or concepts not only to describe the phenomenon in terms of the social, but also would direct and define the very object of inquiry, and how to approach it. In this case it can be argued that observation is guided by and through the use of concepts - such as 'society' and 'the social' - which participate in the production of a particular visibility. I want to make the difference between what can be termed a 'sociological object' and what is to be considered as an 'object of inquiry'. A sociological object can be understood as an object of inquiry that is used to make visible particular sociological concepts. In essence, objects themselves, whatever they may be, become transparent in order to 'observe' society. It is in this sense that sociology in general conceives of empirical work in a substantially different way from that proposed by Deleuze. This is not to say that

the version of the empirical offered here is not unproblematic - in the same way that the 'just observe and describe' of Latour is difficult to comprehend as a straightforward observational method, so is Deleuze's equivalence between being empiricist and pluralist. But this is precisely the point: that method in any form is messy, has elements which are arbitrary, and is always involved not only in the collection of data, but in the configuring and ordering of observations, which together render certain things visible (and invisible). In short, social scientific methods, as with any scientific methods, are messy, complex, and involve a constant dialectical revision where observations and descriptions are folded together in the process of encountering the object of inquiry (Pickering 1995).

It is this very process by which the ideas in this thesis have come about, where (in practice) the observations, the empirical data collected as part of the fieldwork, have never been separate from theoretical distinctions or concepts. Observation in the form suggested by Latour, a following or tracing of networks, is in the words of Scott Lash (1999, p.277) a path, 'a material path, an indexical and tactile path that we trace and then that we lift out and reconnect'. This form of observation utilises a particular means of registering and ordering of that which can and is observed. The term 'following' and 'network' themselves are concepts relating to how to go about observation and the indexing of such observation. The proponents who advocate such a method accept that such terms are themselves active in this process (Latour 2005b; Law & Hassard 1999) and furthermore demonstrate the fluidity and mobility of these terms. Observation as a technique, therefore, does not stand alone but is always accompanied by, and is not possible without, the use of concepts. Thus when instructed to 'just look at controversies and tell what you see', to observe and describe, to follow networks, is not qualitatively different from the equivalence between empiricism and pluralism - they inherently accompany one another in the process of investigation. They are methodological, and dialectical, binaries which articulate the arbitrary distinction between what is considered method, and what is theory. Points of difference can be drawn against each, but neither is a pure category, they are inseparably linked; they form and configure one another in practice.

So how to describe what I see? I would argue that Latour's seemingly glib response is somewhat purposeful. To describe, to 'tell what I see' means to utilise concepts and to create a conceptual vocabulary in order to articulate a phenomenon. The difference for this project is the attempt to make visible the processes of using concepts and conceptual vocabularies as a means to inscribe and describe, and inform observation. The two have not been separated out as distinct divisions of labour but folded together. The uptake of the form of empiricism proposed by Deleuze, means that a

sociological account of sanitation and the city, is an account which does not determine what constitutes society, and thus what is sociologically relevant and observable, prior to entering and encountering the objects in the field. In this document the use of concepts *is* description; concepts enable the articulation of observations, of phenomenon, of occurrences and relations between and across things. I consider description as an engagement with concepts, a creative process in which ideas meet, morph, clash, change, are revoked, reworked, and recreated as they meet objects, as they seek to articulate observation. Concepts themselves are never stable, they are flexible and mobile, open and fluid (Deleuze & Guattari 1994; Gane & Beer 2008). Latour, alongside Deleuze, is about the creation of, and engagement with, concepts: an engagement which occurs in the process of encountering the object of inquiry. The creation of a descriptive vocabulary is something that emerges 'in the field', from the social scientists' laboratory, in the encountering of phenomena as part of inquiry and investigation. It is in this sense that concepts are important in the following chapters because they guide and describe what is being seen; they assist in making things visual and visible; concepts are integral to and generated through and by the interplay of visuality and visibility. This research looks at the work that is done in combining, inscribing, stitching together. The sociologist is a bricoleur involved in a form of craftsmanship, a creative process.

1.4 Crisis and risk

I want to make one last point that is central, not only to my thinking, but to the relevance of this approach. This is the suggestion by Savage and Burrows (2007) that sociology is in the face of an unfolding crisis. Such a prophecy is not a reference to any theoretical epochal shift in knowledge *per se*, but is directed at the methodologies and practices of empirical sociology. In brief, the proliferation, circulation and reflexivity of data and knowledge has repositioned the discipline of sociology not only as a relevant authority on 'the social' but also in terms of access and generation of data on populations and publics, and their characteristics, shifts and changes (Gane & Beer 2008; Savage & Burrows 2007; Thrift 2005). Digitization and the associated devices, languages, technologies and means of tracking, categorizing and observing have become key components of the flow and circulation of the everyday (Amin & Thrift 2002), a flow which is more readily generated and located outside of academic sociology. The crisis is not simply found in the amount of information, the methods of collection, and distribution (commercial and state organisations have adopted and adapted traditional social science methods both quantitative and qualitative), but also the type, detail, and traceability of the data, but

also the technologies, devices and the ways in which all of these participate in the constitution of the social (Graham & Wood 2003; Thrift 2004b; Thrift & French 2002). In this regard, the traditional sociological methods of the survey and interview, in the 21st century, have become increasingly compromised as a means for empirical sociology.

Savage and Burrows do not suggest an abandonment of empirical research, but a reinvigorated focus on the *politics of method,* including an interest in methodological innovation, and description and classification. In the context of those newer methods of tracking and tracing, this chapter has attempted to look at methodological innovation, primarily in terms of the creation of visibilities as an effect from the interplay of observation and description, and in the contingent and problematic encounter of the objects of enquiry. I have argued that concepts and methods, observation and description, are not separate spheres of activity but interlinked and co-evolve throughout the research process, and this process which is usually hidden in social scientific text, will be made more visible in this thesis. I want to show that research is a messy process which emerges out of an encountering with the world. Underlying this, and linked to the crisis in sociology, is the discipline's scientificity: the means by which validity is generated through a claim to the scientific which is achieved through the application of method. For social science the deployment of specific data collection techniques enables some degree of scientific validity. These very same techniques, or at least an over-reliance on such existing techniques and a lack of innovation in methods are what Savage and Burrows claim to be at the core of the crisis for empirical sociology. I want to argue that if empirical sociology is in a methodological crisis then so is the discipline's claim to being scientific.

In his description of the 'Stengers-Despret Falsification Principal', Latour (2004a) is also claiming, primarily through the understanding and deployment of methods, that social science is compromised. In short, drawing directly from Isabelle Stengers and Vinciane Despret, Latour summarises their works which seeks to re-cast what constitutes the scientific through the construction of risk. Scientific risk here means that not only the hypothesis and theories in research are opened to the risk of refutation, *but the entire protocols of the research*; the instruments, the methods, the mode of questioning, the means of measurement. In short the politics of research are able to be questioned, re-oriented and re-calibrated through interaction with the objects of study in the research process (Despret 2005,2008; Latour 2004a; Stengers 2000,2005). Rather than finding ways to eliminate or reduce risk, this is a call to increase risk, increase the recalcitrance of the objects, provide as many opportunities to refute and differ, opportunities and openness to constant re-qualification of all aspects of the research. In this

respect, the platform of sociology, as I have presented it thus far, has a limiting effect. It defines and closes boundaries. It is eliminationist because it does not risk the refutation or requalification of the concepts, the theories, the modes of questioning, or the research protocols. In this set of accounts I do not want to dispense with 'the social' or society' - that is unnecessary - but it is putting to risk what in fact *constitutes* the social, how it is made up, and what constitutes observation and description. I have purposely focussed on the very objects of sanitation, on matter, to emphasise and assist in this point, not 'taking the boundary between matter and society as a division of labour between the natural and social sciences' (Latour 2000, p.108). Society is not something constituted by purely human relations, and thus is to be left open: open to all manner of entities, processes, registers and configurations which participate in the constitution of worlds as they come to be observed. The problematic of sociology for this project has been the peculiar *construction* of seeing society, the regimes of visibility which are produced, yet often never put to the test. Sociology, foremost in my mind and hopefully shown in this document, is a creative and open endeavour, the mission is not to negate or replace this means of seeing society but to expand and to add to it. I am not sacrificing society in order to replace it with something more tangible but allowing society, and the social, to be constituted differently, redefined and described in the empirical encounter with the objects of inquiry.

1.5 (Re)creating visibilities

I am describing this project as the creation of visibilities, each chapter is a particular account, each a different way of observing and describing a phenomenon. What I am describing, in a sense, are propositions of a certain type of world in a certain type of collective (Latour 2004a). Each different account is indeed a material and indexical path in which networks are traced and lifted out, reconnected and reconfigured in different ways and turned into inscriptions on paper. The following chapters will present not simply an object, a sewer network, a series of earthquakes, or a set of descriptions, but an occurrence, a set of visibilities constituted by objects, artefacts, observations, simplifications and amplifications, conceptual vocabularies, attempts to render talkative that which before was silent. They are the creation of visibilities, each of which differs in what is observed, seen, described, and offered as an account. They are also an eclectic use of concepts and ideas offered by such people as Giles Deleuze, Felix Guattari, Bruno Latour, Donna Haraway, Nigel Thrift, and Patrick Joyce; an ode to some of my favourite thinkers. I cannot describe my object without them and the many others that have participated in the construction of this document, this set of visibilities. I have

used the word eclectic to suggest that this is a collection of various things, of observations, experiences, methods and concepts, a bricolage not necessarily intended to form a smooth, precisely and clearly linked set of accounts. There are overlaps, and crossovers, but there are also differences and variations, things which do not necessarily fit together. Both the object - the wastewater networks of Christchurch - and the sets of visibilities given here are fractional 'more than one but less than many' (Law 2004a; Mol 2002, p.55), not singular or plural but multiple. It is in this sense that this thesis does not make an attempt to smooth away differences or create a singular narrative. Each account, each chapter is different, reflecting differences in how to observe and describe such a vast object but also the multiple forms which this object inhabits simultaneously. Because I have invited you into this discussion, as part of this thesis, there is work that you must do, not simply to mark, but to follow these accounts, to think on the criteria offered: have I rendered talkative that which before was silent? Have I been able to articulate the multiple and fractional processes which bring not only the object together, but also this artefact, this inscription. Have I been risky enough?

We begin chapter two in the control room, a space which connects the many corners of the city, a space which culminates in the rendering of the 'city' visible. Through approximately 10 hours of observation in this room, I explore the work that is done in monitoring 'the city' through the urban infrastructures displayed on screens. How and what do I observe in this room? I am at once shown 'the city' - an assemblage of many devices, flows, objects and images, and the work that is done to render a vast network visible. To observe and describe is to follow the configuration and dispersion of this work of seeing the city, and how the action of seeing is dispersed throughout a collective, an assemblage of humans, machines, computers, flows of data. I describe this in terms of the loss and gain which occurs in the creating of the 'social' visibility of the sewers in the control room. In this process different forms of sentience emerge which I describe using a vocabulary developed through the merging of Deleuze and Guattari's (1988) concept of *becoming* with Donna Haraway's (1991) notion of the cyborg - *becoming-cyborg* - to explore the blurry boundaries between the human, machine, computer, sanitation, and city.

In chapter three we move out of the control room and explore the objects which correspond to the visibilities on the control room screens. In this chapter, observation and description merge seamlessly as I attempt to almost ethnographically describe the city's sanitary infrastructures as I follow and trace them. Here I employ the concept of the sanitation unconscious, a merging of my fieldwork and the work of Nigel Thrift (2000,2004a,b), to explore the vast and unconscious structuring of space and the

background of experience that sanitation networks are implicated and participate in. Sanitation, the physical objects which mediate sanitation are described using concepts of space, circulation and flow, and the implication of these things in the unconscious background of experience. The visibility of this chapter shifts between scales which look at cities as urbanised, sanitised and digitised spaces and the reconfiguring of bodies, the individual formatting and competencies calibrated through objects of sanitation in these spaces. This chapter shows the process of fieldwork as a physical searching and striving to see, to observe. Description and observation merge and produce a visibility which shows how the city and how sanitation are correlated, and come to be performed.

The final chapter explores the city using a rather different scale. It is here that the city is a site of continually erupting controversies following the earthquakes. The objects that have featured in the previous chapters are explored in the movement from matters of fact to matters of concern. Drawing on the ideas of Patrick Joyce (2003,2008), I see and describe the city and the objects in question in terms of politics, where particular forms of governmentality are temporarily secured through the deployment of urban infrastructures. A historic form of liberalism, secured through the particular configuration and deployment of objects, is brought into question following the earthquakes. In this process the city and the state manifest, through improvisations and material configurations, in response to ruptured land and severely damaged 'liberal' infrastructures. This is a form of politics that is resisted and reconfigured through the controversies which surround things: sanitation networks, land, and city territory. Using Patrick Joyce's (2003) notion of the rule of freedom , and Latour's (2004b,2005a) movement from matters of fact to matters of concern, a particular politics of things, and the city as a site of controversy are marked and described.

Chapter 2

The control room: observing sanitation

2.1 'This is the city'

'I am god when I sit here' he states in a matter of fact sort of way. That's what it was, a statement. Not necessarily of his own characteristics but what his position, what the seat gives to him. In some ways it is tempting to see this person as powerful, he sits watching, his gaze spans the whole city, with fingertips hovering over the fate of the city's services; let there be pressure, and there is. This gaze, this assumption of control, however, is not threatening; nor am I convinced that such control is anything more than rhetoric. It seems that this shift controller is the recipient of a far harder gaze staring back, probing him, and demanding actions. He is captured: his position is solidified, held in place by other forces and actors, constantly answerable to them. The pager is beeping; the monitors in front of him constantly feeding alerts and data flows; pumps speeding up and slowing down; sewer tank levels rising and falling across the city; communications flickering in and out. There are duties to attend, the phone ringing with complaints and reports, technicians requiring information and direction, management staff requiring competency and stamping their mark upon his working conditions and processes, screens demanding the focus of his eyes and the incumbent position of his bodily frame. The 'dead-man alarm' monitors bodily movement, or as the case may be, any lack of it. No, however tempting it may be to misinterpret this statement, we must be prepared to understand what is being said: this god-like quality is not the ability to control the city but regards a particular vision of the city that is afforded. It is a particular set of views, images, maps, and streams of information by which there are emergent and particular embodiments, performances, an ability and presence through which this figure can gesture toward an array of screens and state: 'this is the city'. This declaration has become an echo in my own observations and thoughts. It is this vision, this mode of seeing, to 'dominate at a glance', to watch over, which is fore-grounded. No, these shift controllers, are earthly figures. The gods, they must reside elsewhere, but tonight, I suspect, I have met their appointed sentinels.

Sentinels because there is a watching, a sense of guardianship, because it is in this control room where observation is said to occur, it is here where I am introduced to the city. But where is the city to be

located? To be observed? Out the large front windows perhaps? Facing out toward the carpark, curiously full for this time late in the evening (suggesting the many other networks of people and objects maintaining this 'city'), and beyond the wire fence and patches of crumbled tarmac (presumably an effect of the earthquakes) there is the long entrance driveway which I drove down earlier (figure 2). A line of trees to the left side, behind which there is a glow from the banks of lights illuminating a sports field. Looking outwards from this room in no way gives the viewer any sense of 'the city', that is, in this presumed wholeness or entirety that my informants' introduction suggested. The shift controllers do not lay their eyes upon a physical city, not on a visible material reality. Furthermore, it seems that 'the city' is conflated with infrastructures - let us not forget that we are standing in the operational head quarters of the water, wastewater, storm water and reticulated gas supplies for Christchurch. A control room, at the wastewater treatment plant which processes all the fluctuating flows of effluent coalescing from citizens' practices and habits, from domestic, industrial and commercial liquid waste. The city here *is* infrastructures, networks of pipes and pumps, valves and outflows, a conglomeration of pulsating networks which stretch and fold, stitch, and hold, a vast and variegated territory together. The view outside, through the control room windows then, bears no resemblance to the city. If I were outside I could stand and point: there is the wastewater treatment plant! But this is one part, one small piece. To see the city, it is suggested by my informant, one must sit down, and look a little lower, the human eye is confined to a room, directed to, and encircled by, screens.

Is this liquid crystal view one of the city? What gives this view its particular city-ness? What in fact is being observed? To draw on this scene empirically, it can be seen first of all that this is not a single view: there are a number of screens which the shift controller observes, each displaying something different, each screen providing a different set of data, corresponding to different objects and things. One screen is a diagrammatic map of the sewer network - this is one view that we will come back to momentarily. There is another for water pressure, another for reticulated gas, and another for storm water, and a separate platform to view the Banks Peninsula systems[1]. A centralised screen, set between the wastewater and water screens, is a monitor which displays the series of alerts and actions which have occurred, on which a GIS map of the city can be accessed, providing details of the

[1] The Banks Peninsula District Council was amalgamated with the Christchurch City Council in 2006. The wastewater for this region is treated in several different plants: Lyttleton, Governors Bay, Diamond Harbour, Akaroa, Duvauchelle, Tikao Bay and Wainui. These plants generally use only the sedimentation and oxidation processes with the treated effluent discharged into either Lyttleton or Akaroa harbours. Much of the water and wastewater networks of Banks Peninsula are as yet not fully able to be 'seen' in the control room.

position of land owners details, property divisions and the position and make-up of the sewer, storm water and freshwater pipelines under the ground. This information includes the location of junctions valves, the types of valves, pipe sizes, pressures and much works related information (for instance which way to turn the valve at given junctions).

Figure 2*: The entrance to the Christchurch Wastewater Treatment Plant (CWTP) where the Christchurch City Council Water and Waste Unit control room is located – directly in front in the red brick section of the building. The large dome in the background is one of the two trickling filters involved in the primary treatment of the city's sewage. Source: personal image collection.*

Off to the left, slightly separated from the rest, is a lone screen displaying a new, updated version of the SCADA (Supervisory Control and Data Acquisition) system that is currently being developed – the city is currently being re-made, the visibility of the city re-assembled through software and code. This is continual: the visibilities are never static or settled, always changing, up-grading and developing. My time in this room, this fieldwork, remains only a snapshot of a moment, itself partial.

Away from the screens, during a different episode of fieldwork, again I hear the fabled words 'this is the city'. This time I am standing in front of towers, banks of processors, flickering LED's, cables and wires flowing out of these units like the very liquids we have been trying to see. This 'city' is constituted through flows of data, information which feeds these screens, which software and code interpret, distribute, record, analyse and present. It seems uncanny that the city can reside here, but this is not what is being said. 'This' was not the 'this' of the screens or the 'this' of the banks of

processors and consoles – it is a gesture toward space, toward the ordering of space. Pointing is not a tenable action here, and it must be noted that neither presentation of the city involved any pointing. Gesturing yes, pointing no. Pointing refers to a particular; a specific place, *pin-pointing*, and neither versions of the city could be so neatly specified or addressed.

The screens and consoles, the banks of processors connected by the latticework of wires and cables, are points of intersection, generators, and participants in the production of visibility, the producers and participants in the city as a flow of data, collected and distributed across intricately coded space. But this picture of the city, the banks of processors are themselves hidden away, invisible. Accessible and relevant only to electrical engineers and ICT personnel, sitting quietly in a separate, closed off space directly behind the control room. Although separate and hidden this room, through its connections to the many pumps, reservoirs, communication networks, flows of data are registered and translated in multiple ways. But this is only part of the assemblage: how is flow communicated, how does it come to be seen? Sanitation comes to be coded – monitored, adjusted, and recorded – it becomes data, streams of data, and sequences of recorded events. To describe this particular aspect of the city as 'virtual' is not at all useful: 'It makes more sense' says William Mitchell (2003, p.4) 'to recognize that invisible, intangible, electromagnetically encoded information establishes new types of relationships among physical events occurring in physical places.' That is to say, that the work of the controller is not 'lost in the screen' (Zuboff 1988, p.xii), or that the city is made 'virtual' through the generation of data and the rendering of the city in computational forms, but rather that software, code, wireless communications mediate the ordering of city space, and enable the city to be viewed, and thus acted upon.

The screens are not static windows of lone isolated images, but are an interface, the effect of multiple transformations, flows of data which constitute visibility. Latour (1986, p.28) speaks of inscriptions and files: '...domains which are far apart become literally inches apart; domains which are convoluted and hidden become flat; thousands of occurrences can be looked at synoptically.' In this case, the images and data accessed on these screens are an extension, a proliferation and acceleration of inscriptions and files. Indeed multiple sites and occurrences are able to be viewed, - are offered to the shift controller (almost) simultaneously. The 'almost' referring to the sense that still only one screen can be viewed at any single moment, obviously such moments between viewing each separate screen are miniscule precisely because the eye can move effortlessly from one screen to the next, one partial view to the next, able in the eyes short movement to constantly 'sum up' or juxtapose these views. It

is also the body position, the screens, the data flows, the software, the processors, and displays, all these set-ups which constitute and enable this multiple visibilities. Viewed together these screens are offering a (particular kind of) coherence, not necessarily between the realities, or visibilities, presented on each screen - although it is important to note that the infrastructures presented on the screens are interconnected[2] - but a coherence produced through a sense of simultaneity.

Can these screens present a type of panopticon[3] in which the city's infrastructures are under a constant, watchful, and human eye? Is this sense of panoptical vision that enables the god-like quality expressed by my informant: 'I am a god when I sit here'? A particular visibility, an ability to 'dominate at a glance', a depth of vision which is seemingly omniscient, the bones of the city, the flows, the underground, exposed to this one pair of eyes, to this lone figure on a seat. But it is premature to call this a panopticon. The 'all seeing eye' of the controller spans no further than this rectangular room, indeed, no further than the screens set across his vision, the eye penetrates no deeper than the liquid crystal displays in front of him. Panopticons, no, but 'olig-opticons' (Latour & Hermant 2006, plan 18): partial views, visions which are not achieved by the eye, or the cognitive processor who belongs to it, they are as much visibilities as erasures. This vision, the ability to see, be it a sewer network or a city, is enabled precisely because of partiality, because of the erasure of much detail. Indeed it is as Latour suggests; that to see the city, one needs to look away. To view the city in its entirety, in its wholeness, in all its detail, belongs in the realm of fantasy, to the omnipotence of unlimited beings, or, to megalomaniacs (Latour & Hermant 2006).

The city that is viewed in the control room is made visible through partial views, reductions, and transformations of objects, movements and flows. The city is multiple forms of data which can be juxtaposed and situated concurrently in time. Visibilities emerging from processes through which there is both 'loss' and 'gain' (ibid). This is evidenced on the 'wastewater screen' that the shift controller monitors: a diagrammatic map showing numbered nodes connected by thin lines to various other numbered nodes (figure 3). Each node represents a pump station; each pump station has a number which corresponds to its identity. This number is often historical, relating to when it may have

[2] For this reason it is difficult to talk of the 'wastewater network' as something separate from water supply which provides the flow of effluent – for example only 20% of water supplied is 'consumed' with the rest entering the wastewater network, by which the pipes are built with specific gradients, materials, sizes and catchment/population volume requirements in order to enable the liquid to flow steadily during 'normal' output. Both water and waste rely upon the electricity supply for pumping, yet during high electricity use periods (such as particularly cold winter days) the council will turn on their diesel generators and diesel operated pumps located in pumping stations in order to ease demand on the electricity grid. Because of this relationship the council receives 'good rates' for their electricity use.

[3] The term panopticon here pointing to that offered by Michel Foucault (1979). The panopticon in this case is Michel Foucault's reference to the ability to see all, through constant and unverifiable surveillance.

been put into commission. There are some significant numbers: 1, 11, 15, 28, and 36 corresponding to the terminal pump stations through which all effluent from the city will flow, these five stations feed the city's liquid waste to the treatment plant: a centralised' system where the effluent is directed back to a single treatment plant (CCC 2004). These nodes and numbers correspond to an out-there, but unseen, physical-material reality. Colours are central to this view, but not the multitude of greens from trees, foliage and grasses, not the hazy blues of the sky, the fiery orange yellow flame where the excess gas is burnt, or the worn greys of the tarmac out the window. Inside the eye is offered only a very limited spectrum: blue, orange and red (on a black background). Each colour corresponding to a particular set of states of each individual nodes/pump station: blue signals normal functioning, Red relates to an alert; orange signalling a pump station which has been manually adjusted.

What is of interest on this screen is a particular state of reticulation: the 1700 km of pipe work, the PVC, concrete, brick and steel latticework which connects the city, carries, directs and mediates the flow of the city's liquid waste is reduced to single lines. They carry no information other than which nodes in this network they connect (figure 3). What is this version of the city of then? What is being observed? The controller cannot see the pipes or the location of the pump stations (one must go to a different screen and vastly different map for this information), the state of the underground network cannot be viewed, breaks and leaks cannot be detected, nor can the speed or quantity of effluent be known (until it reaches the treatment plant). One cannot see how or from where the waste is generated. No-one can see into the pump stations, there is no view of how the pumps are working, or if they are blocked (often this can occur by objects such as rags which jam and block the pumps). I was told of one such instance when, on his way home, the network engineer noticed some smoke and noise emanating from one particular pump station. He discovered that a pump was jammed, something the shift controller could not see kilometres away staring at a screen in the control room (from interview with network engineer, 8th September 2011).

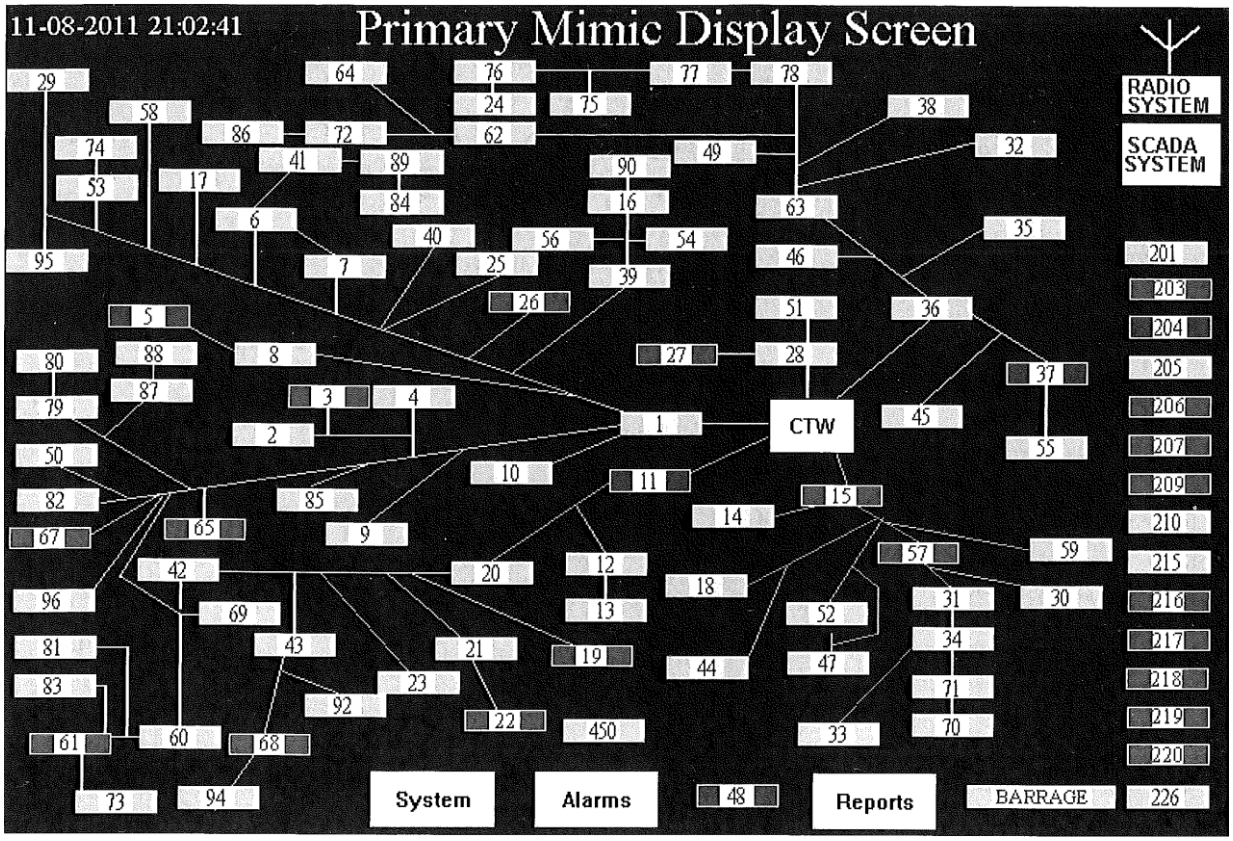

Figure 3: *The Sewer Network made visible on screen. Source: personal image collection.*

The world of the sewer network that the controller oversees on his monitor is simplified and reduced. The detail of this network is erased, made, or least left, invisible. In the process of transformation, of making this particular reality visible much detail is lost. 'But if we talk of the loss', says Latour, 'let's also consider the gain' (Latour & Hermant 2006, plan 17). The loss of detail also enables the controller to view the entire network on one screen: all the pump stations, all the connections, and where each feeds. This vision of the city is afforded by the erasure of detail, the reduction of a vast and complex network to nodes and lines. Of further importance is that the controller can also *immediately see the state of reticulated wastewater collection*. This can be seen in a colour coded glance: the blue coloured nodes signalling 'normal' functioning of the representative pump station, and not needing any further attendance. The (flashing) red nodes, however, are alerts requiring attention, corresponding to pump stations which have strayed outside of the capacities of 'normal' functioning by which the baseline automation of the sewer network operates. The controller, with a click of the mouse, can enter another screen depicting the 'inside' of the particular pump station. Again this view is a simplification, a transformation by which a certain visibility of the working of each pump station is gained. That is, the reticulation of wastewater is made visible on an individual pump station level. Here there is a gain of layers of detail and an ability to move across differing scales effortlessly; the 'global' network and the 'local' pump station.

The ‘global’ view enables a knowledge of reticulated wastewater that would otherwise not be possible. The ‘local’ layer also provides a version of knowing the specifics of reticulation as they pertain to a single locale in the physical networks. The flow of effluent is made visible through sewer tank levels and the electrical current usage of pumps. The rates of flow through each pump station, the actual speed of pumps, or even the inside of the stations are not available, nor, as already mentioned, is the operation of the pumps themselves. Through laser levels and sensors, communication links, repeater stations and software, each pump station is made visible on screen. In fact, this is how the global view of the network is achieved: there is no whole or entirety which is available to be seen or known, or controlled. The screen visible ‘sewer network’ is a network of wireless communications, radio transmissions amplified and further transmitted through repeater stations, and these data streams are collected, collated and displayed continuously through integrated software and hardware technologies – the SCADA system – by which a particular vision of an entire network is produced, where the controllers eye can scan, can glance upon and know.

But this seeing, this knowing is partial, it only corresponds to ‘out-there’ realities through numerous and heterogeneous entities. The partial views are renderings, visibilities, orderings, maps. It is Alfred Korzybski (1948, p.58) who said ‘A map is not the territory it represents...’ and Latour reminds us of this:

> Let’s rather say that the visible is never in an isolated image or in something outside of images, but in the montage of images, a transform of images, a traverse through different views, a progression, a formatting...’ in which ‘the initial point of view doesn’t count; all that counts is the movement of images. All the images are partial, of course; all the perspectives are equal... (Latour & Hermant 2006, plan 19).

Visibility is the movement of traces, of images, of data and information and their transformations. What is seen on the screen are not static representations, they are not images which simply depict a particular reality. The realities of the sewer network are produced through these visibilities. These visibilities, it has been shown, are partial, while gaining the ability to see the network, the processes of making it visible have also obscured and erased much of it. The visibility of an entire network is produced through an informational network connecting individual pump stations, sensors, communications and software. Flow cannot be seen, nor can it be directed without the complicit

visibility of each pump station, and more-so information on the sewer tank levels and electricity current usage of the individual pumps. Detail is lost but reduction is only one half, there is also gain, amplification. The reassembling, the collating and conglomeration, the processing and displaying, produce what would otherwise be invisible realities that correspond to the city's infrastructures. There is an amplification of certain patterns and resonances which enables visibility, enables a network to be observed; that transforms the invisibility of underground pipes and the movement of effluent into something tangible, not residing and relying upon the redundancies built into the pipes themselves, no longer waiting for manifest problems before it can be seen. Sewer tank levels, understood through lasers, pump speed seen through the flow of voltage, coloured nodes on a screen depicting a need to inspect, observe closer and form action, anticipating, avoiding the mundane but disrupting effects of breakage and failure inherent to such a vast, complex, interconnected network.

Alerts, taking the form of flashing nodes, colours, and beeps, demand the observers' attention. Alerts on pump stations can mean a number of things but primarily they relate to sewer tank levels – each pump station moves the effluent from a tank that is continually filled from the connecting sewer lines. When levels get to a certain point alerts direct the shift controllers attention (a flashing red node for example) to this situation over which they exercise some discretion: to leave it be; to start the second pump (all pump stations have at least two); to call out a technician for further inspection. But what action to take? How to exercise discretion? And what will the effect of this action be? None of these can necessarily be definitively known or prescribed. Certainly the alerts do not offer any help, they are in fact rather ambiguous regarding the nature of attention to be given. At this point, it may be suggested that this is why there is a human sentinel occupying this post: it is human intelligence that is required to problem solve. That complete autonomy of action cannot be achieved through 'artificial' intelligence. Pumps and pipes, communications, computers and software cannot run an entire network. There is a continual procession of these alerts and demands, not limited to the sewer network but connected to the numerous infrastructures which have been made visible on the controllers' screens. To be seated next to the controller, this task seemed overwhelming, yet the controller is calm, relaxed. This is despite the many increased failures and breakages which have severely crippled the functioning of these networks since the earthquakes ruptured the very ground in which they are often buried, cracking and splitting pipe work, destroying pump stations and wells, silt blocking kilometres of pipes. The shift controller leans comfortably back in his seat. Clearly visibility does not only reside in the images on the screen. Perhaps this figure seated beside me can see more than what the screens before him offer.

2.2 Sentience

I was caught in the middle of an argument. Somewhat of my own doing, my very presence and my questions had elicited a disagreement between the shift controller and the plant engineer. And now I was sitting between the two combatants, raised voices, swear words. This was an opportunity to understand how the controllers work is done. It began from my questions regarding knowing how to respond to alerts, to whether there are manuals and procedures, and how are these shift controllers trained. There was some disagreement about how training is, or due to my presence in this scene, how training *should* be done. My informant had been involved in some way with this work for 18 years, during which time he had trained a number of controllers and relievers. Is there a training manual, a set of procedures? 'No' was the short answer. There was a manual somewhere 'over in HR' but people learnt by 'sitting in the chair'. Every time training is discussed, the chair is a prominent actor. My informant talked of a particular training style several times; when he trains someone he won't tell them to 'do this or do that' nor does he simply explain what he is doing while they watch. He gets them to sit in the chair in front of the screens. Understanding the network is not something that occurs formally, there is no manual (at least not on site, maybe somewhere else, but not used). One learns through doing, through sitting in the chair, questioning and observing the network: if a pump is turned on or off here, it has an effect over there; a sewer tank is high is there a need for the second pump; what is causing this spike in water pressure? Is it temporary? The high pump voltage could mean increased speed (they automatically modulate), or it could be blocked. To learn to operate one must 'sit in the seat'; there is a symbiosis through which the physical position enabled by the seat and the world into which this connects and helps assemble. In this sense, a manual is an externality, something irrelevant to how one comes to see, comes to know and understand each set of networks. The manual is a would-be imposter which separates the human and the network, mediates the interaction. One does not learn from the manual, one must learn the intricacies of this network through experimentation. One must sit down, engage with the networks, *get a feel for them*; a hermeneutic exercise in which changes, alterations, and decisions must be understood *in situ*, in their interrelations and effects.

What is he looking at? It is not water, not effluent; there are no pumps to be manually caressed into life. The world of the shift controller, it could be said, has been reduced, narrowed, the existence of the networks abstracted - it is not the screens *per se* but the flow of information, it is software which

orders and displays, alerts and notifies. The shift controller does not touch or feel his work, manual dexterity is re-configured. The software, the constant communications, the computer technologies give way to something else, configure a different kind of sensing, touching and feeling. The control room demonstrates a case that there is a sentience which is enabled through technologies. Objects, informational and digital technologies, computers, software and code, means of data generation and processing: such things in this case do not produce a previously observed distance between the human and work, between the human and their means of action and interaction (Zuboff 1988). Quite the opposite. The technologies which mediate this control room bring the human into a particular proximity, into sets of interrelations with objects, streams of data, flows, relation that would not be obtainable outside of the control room. This proximity collapses time and space, it enables the ability to see and observe infrastructural networks from minute to minute, on different scales, without moving from the seat.

To describe this from a different angle, it can be asked: do these technologies stand in for, or replace, humans (Latour 1991,1992)? Indeed the arduous task of constant human observation – which without such technologies now is impossible both physically and financially[4] - is delegated to the mechanical, digital, communications, and software technologies. Communications networks of this kind replace instances where the responsible and observant citizen is relied upon to inform the Christchurch City Council of flashing lights on individual pump stations (see for example (CCC 2011a)). Of course, direct visitation and inspections are done on individual pump stations and other physical 'assets' integral to the functioning of these infrastructures. There is 'physical' labour that is undertaken by technicians whose direction and prioritising of duties, it must be noted, is achieved in part through the technologies of observation that are enabled. If there are faults or problems that are 'observed' in the control room which cannot be worked through by key-strokes and mouse clicks, a technician is sent out. This is besides further technical assemblages in which maintenance schedules are worked through

[4] The Christchurch City Council (CCC) has increasingly moved toward greater use of consultants and commercial contractors for tasks such as design and maintenance of their urban infrastructures. For example the CCC Water and Waste Unit is primarily responsible for 'operations', with maintenance, both planned/routine as well as emergency/unplanned work undertaken by City Care Ltd - a Council Controlled Commercial Organisation (CCCO), which is a commercially run arm of the council that awards a portion of its profits to the CCC which offsets rates. This shows a further interconnection of infrastructures which stretches beyond the physical objects and into specific financial arrangements between infrastructures, citizens and governing institutions. Further to this, after the earthquakes this approach to reduced direct staffing meant that the Council struggled to respond to the damaged infrastructures because there were not enough experienced workers, but also because of the lack of explicit knowledge and experience regarding the networks by the new contractors who were taken on to work on these infrastructures. This facilitated the appointment of one of my informants – the network engineer – whose responsibilities partly are to ensure the capturing and compiling of knowledge and information which is implicitly carried about the wastewater and water networks (from personal interview with network engineer, 8th September 2011).

on the basis of monitoring of 'asset performance' which are linked to financial projections and overall city administration budgets (CCC 2011c).

But none can visit the entire network, none can see or observe the network in the way that a technician or engineer can walk through the doors of a pump station, set their eyes upon, or hear the deafening and unrelenting hum of the pumps, or take in the distinctive and unavoidable aroma of the untreated sewage flowing through these pumps. The controller is afforded, besides a unique and particular set of visibilities, an emerging sentience. There is a performative sensing, a learning; an implicit knowledge which is created through the union of computer and machine that would otherwise not be possible. It is this sentience which enables a controller to see what I cannot, sitting next to him. This is a sentience, this is a way of knowing how to respond to alerts, how to ask the network questions, to sense and to act in unison with it, which is not available from manuals or expert knowledge regarding this particular network. Such enabled sentience has been highlighted during earthquakes in a number of ways.

First, as I have already demonstrated, there is an ability to see what are, in a number of dimensions – such as an entire network, the flow of sewage, and electricity - physically invisible. Such a visibility is produced through the continual flows of data, a movement of traces, chains of events in which many objects and actors participate. It is more than images on a screen; it is communications links and repeater stations, processors, sensors, wires, even duct tape. Inspecting these screens, the monitors set in front of the controller, I notice that the base of each monitor, each window into the city, is secured by two pieces of thick, grey and fraying pieces of duct tape. My informant sees me notice these stabilisation devices and regales me with his experience of being in the control room during the earthquakes - a tale of shaking ceilings, falling screens and panic. Immediately after the September 4th 7.1 magnitude quake, the shift controller's manager phones, wanting to know what has happened to the city: 'let me pick up the screens and ring you back' the controller says (from interview with shift controller 4th August, 2011). While the screens lay on the floor (and for that matter, if they are without power) the 'city', the infrastructural networks which constitute the city, could not be seen. Without the screens, or any other number of technologies in this collective, cyborg sentience, those who wished to view the city in this respect are blind, or at least, *dis-abled*.

My informant describes another episode in the period immediately after the February 22nd earthquake(s). The control room is crowded; it has become a de facto operational centre in response

to the severely damaging effects of the earthquakes on the city's infrastructure. There is City Council management at several levels up the chain of hierarchical organisation present in the control room. My informant is on duty, doing his best to maintain efficient functioning of the networks as well as ascertaining the level of damage and functioning of these infrastructures. Members of the management are questioning the controller regarding 'his actions': 'they say, why are you doing this or why are you doing that? 'I had to tell them, well, we need water pressure for the fire hydrants' (from interview 4th August 2011). While there are many in this room who have greater technical knowledge and understanding of these infrastructures ('I am just a cobbler by trade', my informant keeps telling me), there is an implication that all these managers and experts have a distanced knowledge regarding these networks. My informant has a knowledge, an experience that others, who are not in the seat, not learned or attuned, are not privy to: the intricacies, flows, and workings that the controller is plugged into. Technical knowledge is only a very partial means by which these networks are observed and understood. There is a degree to which the shift controller infers a sense of craftsmanship, a skilled artisan who approaches the work of monitoring infrastructures through feel, through embodiment, through a particular and sensitive connection with these objects, with the city.

'Computerisation', says Shoshana Zuboff (1988, p.61), 'brings about an essential change in the way the worker can know the world and, with it, a crisis of confidence in the possibility of certain knowledge'. Zuboff was looking at the *introduction* of computerisation into the workplace several decades ago now (1978). However 'computerisation' has become an everyday and essential aspect of the workplace, indeed, of the world. Whole cities are now spaces that are arranged through computerisation, and more-so, ordered and produced through software and code (Crang & Graham 2007; Dodge & Kitchin 2004,2005; Thrift & French 2002). This proliferation does not necessarily displace as much as *re-place* the human in webs of dynamic interrelatedness through which emerge differing and new ways of sensing and knowing the world. The control room is an example of the re-working of space through technologies, a production and knowing which coalesce simultaneously 'inwards' and 'outwards'. That is, it participates in the constitution of the city, how it is known, perceived and acted upon, and such ways of knowing fold into the very arrangements through which this constitution is assembled. Zuboff's statement that computerisation changes the way we can know the world still holds. The dynamic inter-relations occurring from the seamless merging of networks and persons produce ways of sensing and knowing which, rather than producing a 'crisis of confidence', reconfigure and increase the scope of human competencies. This is a 'cyborgian' (Luke 2004) competency that transcends beyond the boundaries of flesh and bone, wire, plastic, or silicon and metal. It appears that in the

control room, the controller is certain and comfortable in the emergent connections in which responsibility for an entire city's constant flows and fluctuations do not paralyse, perturb or cause doubt. This is in contrast to the interpersonal relations between bosses, colleagues, and employers which seem far more tumultuous, uncertain, and loaded with hierarchy.

When sitting before the screens the shift controller demonstrates a particular virtuosity that comes with 'controlling the city' in which one person can observe, manage, and adjust, the needs of a city – interpreting signals and signs, intellectively approaching sewers and water systems. Action is not defined through reaction: a drop in pressure; an overloaded tank; a high voltage on a pump; a storm-water overflow. Alerts are not necessarily alarms but another line of communications not qualitatively different from the wireless signals distributed across the landscape between the control room and the numerous pump stations. Latour imagines the electronic voices of sluices in the SAGEP control room in Paris (Latour & Hermant 2006), likewise the control room in which I sit stretches out across the city with a multitude of objects, things, *entities*, that are in constant communications, generating and receiving signs and symbols. By the many sources and unrelenting flow of data this would be, one could imagine, a deafening cacophony of hums and whines, beeps and squarts, a multitude of electronic voices chattering, making demands, receiving orders, giving reports, feeding information.

What is being attended to are signs, and signals; flows, yes, but of information which has gone through multiple transformations, which are then folded back - continuous feedback loops. Digitised divisions of labour in which the shift controllers are implicated. Networks and persons are seamlessly merged. This work, it became apparent, regards a sensing, an intimacy with the city, with pumps and pipes, pressures and volts, events, daily and weekly patterns, social habits and seasonal fluctuations. A sentience where sensors, processors, wires, computers, screens, software, are prosthetics, they enable a vast and refined sensing, in which the continual pulsating flows of the city can be known and can be perpetually questioned and adjusted minute by minute. Objects and technologies extend sentience, blurring of the boundaries between the human and the non-human: a cyborg state relinquishing these boundaries as natural distinctions. Observing 'the city' is an assemblage, a process, populated by many mediators and mediations. Seeing and acting upon the city is distributed across a multitude of entities. Sentinels they remain, but sentinels plural. Sentinels not only of the organic persuasion, not just the small number of humans who are employed to sit and watch the screens for eight or twelve hours each shift. The guardianship of the city, of the city's infrastructures, is not a lonely outpost in which a lone figure stares outward, but a collective of many entities, a crowded

affair. The lone figure to which I refer does not look outward toward the material city, but looks down, away from this view, in order to see. The screens are part of a constituted telepresence of the city, a digital union, a set of partial communications in which our human is implicated. This figure, this human, is but one of the many watchful entities that monitor, responds, act and communicate. Perhaps, though, he is also the only one who can leave at the end of the shift, able to move about and de-couple. Once away from this room he is sentinel no more. But on shift there is transformation otherwise impossible; there is an enabling of vision and sense which stretches beyond flesh when he enters the control room, begins his shift, sits on his chair.

And what of the humble chair? The seat is implicated, an object of great importance which the controller continually articulates. This chair is not a metaphor, cannot be reduced to a mere symbol, it participates, an actor, something which accompanies and unfetters the body. It is the chair that initiates the human into a very intimate 'cyborgianization' (Luke 2004); an ordering of human and non-human in which the two are not separable but mutually connected and dependant. The chair is not 'just' an instrument made of foam, vinyl, plastic, arm pads, castor wheels, gas cylinders, bearings. Not only an implement procured through invoices and department budgets from national chains of office supply stores; manufactured and sourced through a plethora of commercial, legal and transportation networks which conspired in the very presence of this mundane element. It is a boundary; it is only those who sit in it, in front of the screens that come to know the city. The chair is the initiate of bodily integration, an initiate of the enmeshment of the human and the non-human: in the positioning of the body before the screens, there is a moulding, in which the controller and the network, the 'city', merge. One cannot access the network, cannot view its intricacies, and cannot know, without first sitting.

2.3 Notes on becoming-cyborg

I have described, in some degree, aspects of what I want to term 'becoming-cyborg'. Let me start with the cyborg. A cybernetic organism. An alternative, political trope offered by Donna Haraway a number of years ago now:

> A cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction...but the boundary between science fiction and social

> reality is an optical illusion. Contemporary science fiction is full of cyborgs – creatures simultaneously animal and machine, who populate worlds ambiguously natural and crafted (Haraway 1991, p.149).

Am I saying that what was observed in my field work, what I saw in the control room was in fact a cybernetic organism? A 'hybrid of machine and organism'? This answer to this lies in the very intersection of this thesis and the object of investigation. I am trying to explore the method assemblage (Law 2004) of a control room, of a wastewater network, the making of a city visible and collaborative work that occurs between human and technologies. This is about the constitution of visibility and how this folds into practices and effects, not necessarily as intended consequences or deterministic outcomes of technological invention, but transitionary and contingent processes. That is, techno-social relations emerge through the conjoining of technologies and humans, by which essential qualities and natures cannot describe either, nor are trajectories of such relations inherent. The notion of the cyborg explores the place of technologies, even ones as rudimentary as a chair, and how they might participate in the socio-technical collaborative processes of overseeing the city, and the responses and actions that result from this. This takes one step further than, for example, control room studies which do take seriously the role of technologies such as phones, screens, shared information systems and CCTV (Heath & Luff 1992; Heath et al. 2002). Technologies - such as the screens, processors, and software in the control room, do not exist as a piece of the collective puzzle, they are not simply utilised and configured according to work practices, they also reconfigure the 'user'. They enable possibilities, they are not separate or passive but active, continually in feedback and communication, always linked but also interminably reliant upon the configured bodies, and senses that the technologies are conjoined with. Thus the cyborg, while a concept, is also a means of observation through which the separations made between what is human and what is not are removed. Just as there are processes which constitute visibility in a control room, so there are in the production of a thesis, processes which render things visible, where things are reduced and amplified. It would be rather ironic to over-look this point: to, on the one hand, highlight processes of visibility when approaching the object of study while, on the other hand, obfuscate such processes cultivated in this work.

The question could be asked: from where do I view? From what position(s) or standpoint(s)? If I am to follow Latour into this fray then the previous question should be revised, which allows a certain symmetry to be utilised: what is the researchers gaze, regime of visibility? What affords my vision?

This is not a call to reject any capacity to 'objectively' encounter realities, in the sense that the perceptive senses are unreliable or untrustworthy. It is the recognition, as suggested in the first chapter, that visuality encompasses a much larger sphere than simply the eyes (and the associated brain functions). The ability to see does not exclusively belong to sense organs or even humans. And secondly, that it is a process, it is afforded: visuality occurs not as an inherent state, but to some degree, as an effect.

To return to the question of the cyborg. Did I have to rub my eyes in astonishment as I walked into the control room? Nothing so dramatic in effect, but methodologically and theoretically (although I hesitate to clearly distinguish between the two) there is always a double take in which the fieldwork itself goes through a process of transformation - the data, the observations, the words, memories, facts and figures are reduced and amplified in the social scientific laboratory. Observations become notes, ideas, pointers, themes, quotes; they are funnelled and strained through concepts, kneaded with ideas and theories, negotiated with educational requirements, time scales, and word limits. This is where the experimentation of social science continues, not just 'in the field' but in the entire process of producing text. The processes of loss and gain are at work at my desk, on my computer, in the books and articles read, the fieldwork undertaken, the research technologies, the narratives or genre's utilised, the objects encountered and used, the people talked to, the observations and regimes of visibility I am afforded. Striving always to see, to make visible, render observable and simultaneously describable. I cannot give every detail, every nuance, every artefact, image or piece of data. Producing this piece of research, this document, is also a method assemblage; in the same way as detail is lost in the control room where objects are translated into flows of data and images, so it is the case here. One cannot mourn this loss any more than embrace the gain. What am I looking at, observing, what is visible? Many things, more things than I can possibly see, let alone describe. The overwhelming sensation of being in a field which is highly distributed, and vastly and variously populated, subsides as, first I look away, relinquish the task of seeing a whole, an entirety, and like John Law, I look for resonances and patterns (Law 2004a), partialities, working them into descriptions. I have gained a certain, and particular, visibility.

How is it then that phenomenon occur? This is precisely the point, that there is a continual ordering of things. What is being seen are *processes of ordering which produce effects*. Ordering is never a smooth or linear transitioning or transformation; there are often blockings, ruptures, and resistances that accompany what at first glance may seem to be fixed or stabilised realities. Stabilisation is an effect,

these stable entities are black-boxes (Latour 1999): 'settled' controversies which have coagulated into singularities, essential qualities and realities which are greatly enabled through erasure. Ordering involves an othering of the many heterogeneous populations, controversies and work that has occurred by which the constitution and production of such realities are made possible. That is, we see a human, a single person who 'operates' or 'controls' a 'city'. The apostrophe's indicate some instances where the many transformations and mediators are lost, made invisible by what Latour refers as the 'modern constitution': the work of purification by which there is a complete separation of, yet a simultaneous paradox regarding, the transcendence and immanence of Nature and Society (Latour 1993). In this case, what constitutes a city? Well, many things. Far more than can be possibly seen or described. Yet somehow this vast conglomeration of objects, people, boundaries, activities, political, legal and economic flows become erased to some degree in the simple word 'city'. In their exploration of Paris, Latour and Hermant (2006) make some hidden aspects of the city visible: cables, automatic bank tellers, meteorology, street signs; so many agencies, objects, technologies, psychologies, and interrelations which are routinely invisible yet fundamental to the flow and movement of everyday living, and yet are often absent in the sociology of everyday life. Such things, however, are divided up, human and non-human, organic and in-organic, animate and inanimate, and the processes and work that connects these heterogeneous entities are erased, hidden away, made invisible. A street sign becomes a singular image and the relation between maps, between geography, local history, bureaucratic processes and surveying are purged of their relevance to the experience, the very possibility and logistics of locating oneself, of walking down the street.

In the case of Christchurch, where earthquakes have ruptured the very ground, such smoothness, such singularity, is harder to maintain. The very life-sustaining services and objects, city infrastructures supplying clean water and removing waste, have literally come to the surface, exposing all manner of invisibilities and the relations upheld through pipe work, wells, pumps, control rooms and communications links. In the event of damaged water supply and sanitary networks the strict separation between the human and the non-human, what is animate and what is not is less clear. Rather than separations, rather than purifying categories where the intent of the human is purged from objects and technologies, there is mediation and translation. Interests move and are transformed through the progressive associations with the many entities which enable the functioning, the existence of the city. It is through method concepts such as agnosticism (impartiality between actors engaged in a controversy), generalised symmetry (the commitment to explain conflicting viewpoints in the same terms) and free association (the abandonment of all *a priori* distinctions between the natural

and the social) (Callon 1986, p196), that all manner of heterogeneous actors - objects, artefacts, technologies, regimes and ideas - form part of this discussion, where no separations between natural and social, human and non-human, a vast class of actors are made visible. Agency, the ability to act, to 'make a perceptible difference' (Law & Mol 2008, p.58) is not a fixed humanistic property but distributed across networks and associations with these heterogeneous populations.

The cyborg describes the blurring of the very boundaries between what is human and what is non-human, between what is social and what is natural, a merging of organic and in-organic which could be observed in a particular form of sentience enabled in the control room. The shift controller is a cybernetic being, the control room, and the technologies which cascade outwards and inwards from this space are vast and complex prosthetics. Things can be seen that would not be possible without sensors, lasers, radio waves, pipes, pumps, processors and software. New degrees and dimensions of sentience emerge in which a human comes to sense objects, anticipate them, and understand their states, the continual rolling of action. Able to ask questions and get answers without uttering words. Action is distributed across networks. The cybernetic organism is manifest in this distribution. A distribution which does not simply stretch 'outward' from the intentional human, but revolves in constant reciprocal feedback. It is not only the shift controller that oversees - the capacities and reconfigured sentience are of course integral - but this biological element of the cyborg is constantly monitored. The seat and desks position the body, not only in front of screens but under watchful 'eye' of the 'dead man alarm': if this body is not sensed through movement, a set of different alarms and protocols come into play. Text alerts progress through management chains in order to ensure the sentience of the network remains active, that the visibility is being processed and responded too. Activity in the control room is interdependent and conjoined: disconnections, either through loss of communications, toppled screens, or the shift controller being overcome with sleep, require immediate actions in order to re-establish the integrated functioning of the cyborg.

An important distinction to be made is that the cyborg is not necessarily produced, certainly not intended, but are emergent interrelations through which heterogeneous entities come into association. The boundaries between bodies and things, human and non-human are furiously blurred. The cyborg refuses the lineage brought through the myth of filiative relations - meaning that ontologies and natures are radically altered and dissolved. *Becoming* also refuses the structural categorisation of relations and thus possibilities: 'It concerns alliance', it is involuntary, it is a movement between evolutionary or filiative perceptions, 'by transversal communications between

heterogeneous populations' (Deleuze & Guattari 1988, p.239). *Becoming-cyborg* is a double verb of non-classificatory being in which the specifics of corresponding relations and productions do not adhere to natures; all are hybrids, quasi-objects (Latour 1993), de-natured (Haraway 1991; Luke 2004). What Deleuze and Guattari (1988, p.240) call 'unnatural participation'. *Becoming-cyborg* is not about reproduction: cyborgs resist and rework nature, they don't 'reproduce' but rather move, populate, spread, and proliferate; heterogeneous entities come into association and alliance. Becoming is not imitation or identification. It is a re-territorialisation of space, of body and of sense. It is also the population of the machine, of the networks, of the city, an assemblage of human and machine - a 'humachine' (Luke 2004) - a conjoining of relations between what are seen to be separate and incommensurable entities and natures. Becoming is the movement through which associations derive, it is the process of re-configuration in practice: the initiation of the seat is a process of becoming; the emerging sentience in the control room would not be possible without becoming. It is the process through which 'cyborgianization' is far more intimate, specialised, and particular to the control room encounter, particular because bodies and humans, in fact urban humanity is already highly cyborganised:

> Without the agriculture machine, the housing machine, the oil machine, the electrical machine, the media machine, or the fashion machine, almost all cyborganized human beings cannot survive or thrive, because these concretions of machinic ensembles generate their basic environment (Luke 2004, p.109).

I would add the water machine, the waste removal machine, the drainage machine, and all that such infrastructures encompass. In this sense it is not the controller but the entire city, a mass becoming, of lived relations, lived techno-social relations, in which the organic and inorganic are colonized and reformed, in which the entire peopling of the city is both reliant upon and re-formed through technological and informational assemblages. The pure organic is quietly removed, mediated, altered. Cities are not places in which humans reside, but are the sites of production for 'machinic assemblages which intermix categories like the biological, technical, social, economic, and so on, with the boundaries of meaning and practice between categories always shifting' (Amin & Thrift 2002, p.78). That is, cities are cyborganized and denatured assemblages, vast hybrids populated, crowded and thronging not just with humanoid figures, but objects, things, flows: flesh, plastic, chemical, mechanical, psychological, electrical, biological, informational, human and non-human, all amassing and joining, separating, pulsating, flowing and resisting. The category of pure organic is irrelevant. The

city is not synonymous with its people, bounded flesh and blood characters are an ambiguous category. Humanity is a series of appendages, divorced from what is viewed in the control room. To live in this city, is to live in communion, in inseparable relations with that which crosses the modern divide: pipes, pumps, communications links, reservoirs, treatment plants, wells, control rooms and data streams - elements considered non-living yet which sustain city life.

It seems that we have made a conceptual leap from the one to the many: from the control room seat, to the entire city. Exactly! 'This is the city', I am told time and again. This? Six screens? Banks of processors? Flows of data? A set of partial views, a visibility. But such a visibility is not static, nor passive, it enables a vision other-wise impossible, and importantly, this encounter demonstrates an altered sentience in which there are new ways to sense and know the world which emerge through interrelations with technologies and objects. A reciprocal and generative ordering by which the city comes to be seen and known. I have called this *becoming-cyborg* to demonstrate the merging of human and non-human and the essential blurring of boundaries and intentions, amplifying the denaturing processes by which a technology ridden life is characterised. But inseparable to this account is also the very processes of seeing which occur in the production of this text. *Becoming-cyborg* is a method-theoretical account of fieldwork observations. Description, theory and method are not neatly separable elements but intertwined and messy parts of the social science laboratory. Latour's advice to 'just observe and describe' (Venturini 2009), as mentioned in chapter one, is an oversimplification regarding a complex and difficult task. Maybe purposefully vague in order to force one to look harder and describe more thoroughly rather than mimic the efforts and descriptions of others. The point being that description does not distinguish between the 'out-there' object of investigation and the 'in-here' processes of seeing and forging such descriptions. The two are also inseparable entangled and folded together. I began this chapter with a particular episode which stuck me when my informant, the shift controller, reclined in his seat swivels to face me and proclaims 'I am a god when I sit here'. There is a particular resonance as I sit in a similar chair, I face a similar screen. I purport to understand, to describe, to inscribe with words, a particular visibility. To myself I could say: *I am a god when I sit here*.

Chapter 3

Embodied practices and the sanitation unconscious

3.1 Kojo Moe

> It's not easy to see a phenomenon, to make it appear. Infinite respect for images - iconophilia - is needed, and at the same time one must not pause, fascinated, on an image, since it points to something else, the movement of its transformation, the image following it in the cascade and the one preceding it (Latour & Hermant 2006, plan 19).

It has recently occurred to me that the last several months of research had landed me in a position where I could no longer directly observe or explain my object. Every time I seemed to get closer, the object dissipates, disappears, continually eluding description. I had seen the officialdom, talked to controllers, observed, researched, consulted and read about this thing. The control room had presented partialities, liquid crystal views set in a room, enabling a particular description, certain visibilities which made some things possible to see, but also obscured much. I still felt *as if I had not seen my object*, that it still needed to be searched out and understood. I needed to venture outside of the control room, to encounter the corresponding realities, to recover the detail, to follow the traces. This new phase of fieldwork took on the character of a searching, of wandering. But what was I looking for?

I found something. I followed a road map, correlated it with drainage co-ordinates, I tracked the Avon river a small way, until I found it. An outlet, an overflow. A pipe which fed directly into the river. In fact there were two. Both set in concrete, water stains showing the route of the flow out of the pipes. There is no flow at the moment. I stand, looking, wondering about them. Impressed by them, enigmatic creatures, evidence of an invisible world, two lonely overflow pipes, at the end of a street. In a way, I have made them mine; no-one else seems to regard them as significant. A man and dog walk by on the opposite bank. Probably wondering why I am looking across the river at these things. They don't see what I see, nor I would hazard a guess, would they care. Nothing can be seen in the pipe, it is dark inside, two black holes. *Black holes on a white wall*. I think of Deleuze and Guattari (1988), of the abstract machine of faciality, the white wall/black hole system. It is this sense of

mystery, of something found. An arbitrary feeling, it harboured no logic, a white wall with black holes. It is composition, beauty, mesmerising, senseless. Meaning is not implied, cannot be applied - it is abstract. I see a face, not a resemblance or anthropomorphism; the objects took on a quality which I was not prepared to give them. Not in feature but in a communicative enabling of significance and subjectification. Or rather, it becomes the temporary meta-structures for the production and flow of significance and subjectification. At that moment the dawning of something still indescribable and elusive lodges in the subjective consciousness, a rupture occurs, the simple composition of objects captured through the abstract machine of faciality affects a fissure, it is on one plane a becoming, on another a new knowledge forming, on another an experience, on yet another a visualisation; a multiplicity of the sewer, a sewer-man-becoming. For a fraction of a second I am lost.

Figure 4: *Black holes on white wall. Source: personal image collection*

I would track riversides, following the twisting bodies of rivers, searching out evidence of this invisible labyrinth; storm water outlets, over flows, open waterways, pump-stations. I found myself looking up maps, driving, even circumnavigating the treatment plant, as if being beckoned. As with a searching for something lost, I return to the first sighting, the place of faciality; the white wall/black holes of the Fishers road overflow. In my car I begin to follow the river, looking for existence, something to alert me, things to legitimate the search, to suggest that a search was the right course for seeing, for

visibility. It has been raining, wet and the river is high, it hides many things, or at least, keeps them hidden. But there is something that keeps repeating in the most material sense: signs have been erected along the river banks alerting the public that the water is polluted, the sewers are overloaded, barely functioning in the aftermath of earthquakes. This is what I am looking for, a sign indeed, another implication of the water way as part of the networks of the city. Along with the pump stations and the treatment plant, the mundanely invisible shrines to the underground activity of a city, it is these overflow points and these signs which attest to the presence of what I am trying to see. But also in post-earthquake Christchurch there is a flow of raw or untreated sewage directly into Christchurch's rivers and waterways. Suburbs are dotted with temporary diesel operated sewerage pumps. Temporary over-ground sewerage and water pipes line the pathways, and roadsides. These are physical inscriptions which implicate these twisting bodies - rivers and waterways - as part of the city's waste system, connecting the invisible lattice work of pipes underground and waterways, flows of the city.

These journeys, these wanderings, were akin to a pilgrimage. Not dissimilar to William Mitchells' (2003, p.1) 'electronic pilgrimage' to the site of the first wireless transmitter that crossed the Atlantic. But whereas he 'looked to the heavens for guidance', that is, to the digital and informational networks which could be said to have 'arranged' his meeting with an aesthetic site of significance, I looked to the earth, to rivers, landscapes and structures. And herein lays a realisation: I had an urge to come 'face-to-face' with the networks, to be proximate to the corresponding realities of the city as it was seen in the control room. But is this any different from the urban explorers who track the sewers, drains, and subways of cities? From tourists who seek the guided exploration of the damp and dark places of the urban? Or from those who desire to take in the fascinating aesthetic of enormous factories[5]? My searching had been, more than anything, a Kojo Moe, my form of factory infatuation, to stare, to take in an aesthetic. This factory infatuation, this Kojo Moe, self-initiated episodes of fieldwork-cum-tourism of Christchurch's water and wastewater networks delivered a series of encounters which brought me images of the normally invisible monuments which enable city wide sanitation. They also delivered a manifestation of the city, through earthquakes, which is turned inside out: sewage that normally travels underground is flowing through the rivers and waterways, liberated from its earthly sequestering it travels in pipe lines on footpaths and roads. Broken tarmac, exposed pipes, pump stations that are damaged and displaced. Another version (and vision) of the city.

[5] For urban exploration see for example Margaine (2012) for underground tours see Spiegel (2009) and for an example of Kojo Moe see Wakabayashi (2011). On a different take on 'urban exploration' and the notion of Kojo Moe see Self (2012) on the love of the London tube system.

Yet, in all of this, I was at a loss for words, at a loss of vocabulary. No language, no means of description by which to harness this expansive, often hidden, series of working monuments. I have lived in Christchurch for many years; the places were immediately familiar but, at the very same time, began to take on something new, a different realisation maybe. It was as if I was displaced from them, as if each building, pump station, reservoir, was disconnected, floating, occupying their own spaces. There was, *is*, a sense of mystery to these objects, these buildings, these spaces: what connection do they have with me? To the water that flows from the taps in my home, the waste that disappears down my drains, down the toilet? How is the city performed through such objects, through sanitation? My Kojo Moe needed to move beyond iconoclasm, beyond the aesthetics, beyond images. To remove the distance that is harboured in the viewing of objects as images, to seek out the traces, the connections, and the means of performing. It was with this in mind that my next phase of fieldwork was embarked upon, in which I came to spend time visiting pump-stations, reservoirs, offices, earthquake damaged sites, the ocean outfall and the entirety of the treatment plant.

Figure 5: *From left to right Pages Road, # 1 terminal pump station, Sluice gates to Oxidation ponds, #11 terminal pump station entrance. Source: personal image collection.*

Figure 6: *Bromley wastewater treatment plant, the foreground is an odour control site, the pipes in the centre are part of the sedimentation tank process situated directly below them, and the domes in background are the two trickling filters – these are all processes aimed to remove particulates from the sewage. Source: personal image collection.*

Figure 7: *In the foreground is the clarifier, after which the wastewater goes to the oxidation ponds. In the background are where bio-solids taken from the wastewater are processed and dried, and then used as fertiliser and biomass for landfill. This process also produces gas which is used to generate electricity for the treatment plant and a number of other council operated facilities. Source: personal image collection.*

To see these places working, moving, humming, pumping, processing. Seeing them up-close, expose my senses and experience them. To see how 'cityness', that is, the realities which correspond to the control room, are performed. Introduced to another type of guardian, the network engineer, I was taken to the many corners of the city and all in-between, weaving through the streets, suburbs and waterways of the city. Armed with a high visibility vest, hard hat, ear defenders, and a minder, I enter many spaces, structures, offices, and back rooms: crossed boundaries, through gates and entered restricted sites.

> Now the face has a correlate of great importance: the landscape, which is not just a milieu but a deterritorialized world.' In which 'architecture positions its ensembles - houses, towns or cities, monuments or factories - to function like faces in the landscape they transform (Deleuze & Guattari 1988, p.172).

I am traversing a transformed landscape, deterritorialized and reterritorialized worlds in which the body, the city, and the sanitation machine form and fold into one another. The face-landscape correlate fold into one another. My Kojo Moe is a striving to see a landscape, but in static images at a distance. It is in the close up, by the movement across this deterritorialized and reterritorialized world, across a particular organisation and ordering of worlds, by which I come to know and see the city, these infrastructures. Each time of crossing the thresholds between the aesthetic image and the close up, to a lesser or greater degree, at times slower or faster, held moments of fluctuating intensities of knowing. This traversing of infrastructural networks, of the physical-material objects of sanitation, there is a realisation of the transformation and folding of the body, of the city, of spaces and histories. It is the echoing footsteps and hushed silence (despite at times the deafening pumps) that pervaded these restricted and privileged sites and spaces. These were 'thin places' - places which 'transform us - or, more accurately, unmask us' (Weiner 2012). These thin places which I visited indeed began to present the city unmasked; they are the places, in part, through which we are transformed, *made sanitary beings in sanitary spaces*. Liminal places, hidden, invisible, and mundane. It was through crossing this threshold, the gaining of a certain proximity unavailable in the control room, unreachable through the distance of Kojo Moe, that an inescapable experience of the familiar unfamiliar: these networks, buildings, processes, objects, and technologies; we know they exist - somewhere - that they do indeed mediate our collective lives - somehow. They are mechanical biological extensions, the prosthetics of sanitation, they perform the city. They form a background, an unconscious background, the 'there-but-not-there' of living, we know them yet they are unknown, hidden, quiet, silent, invisible to us. These objects, working pulsating, humming monuments, form part of our *Sanitation Unconscious*.

3.2 The sanitation unconscious

The sanitation unconscious is a concept adapted and developed from the thinking of Nigel Thrift who offers the concept of the 'technological unconscious' as a way of registering a 'powerful infrastructural logic which allows the world to show up as confident and in charge' (Thrift 2004b, p.176), when in fact they are productions, achievements through which our sense of cosmological order, of rightness and wrongness have come into being, gain momentum and produce a 'stable ground for practices' (ibid, p.177). The sanitation unconscious, is part of this potentially 'vast agenda of research that is being opened up' (ibid, p.177) through the exploration of the co-evolution which occurs through the

arranging of bodies, objects and spaces. The technological unconscious is a particular set of effects which digital and informational technologies engender. Through software and code, space and our experience and practices, come to be re-worked and transformed. For Thrift the unconscious comes to be located in software technologies which participate in the production of spaces and the building of practices, particularly that of the everyday experience. The unconscious being the registers and practices which form our 'background of experience', by which we come to know and act in the world. The importance of this concept is the location of this phenomenon which is not one which belongs exclusively to the body and certainly not a function of cognitive attendance, but in the arranging, aligning and ordering of bodies, objects and spaces. This is an emergent and contingent process that nonetheless forms a particular sensibility regarding our environment, and offers up sets of practices and courses of action.

Tim Ingold states that it is not by the physicality of the objects that we come to know and experience our environments: 'The environment, in short, is not the same as the physical world; that is to say, it is not describable in terms of substance' (Ingold 2001, p.265). In this case, the possibility of sanitation and the correlate with the city is not necessarily describable in terms of the physical networks of pipes, drains and pumps etc, nor by or through the intended functionality of these particular material networks. Sanitation is not merely a series of objects, not merely a function of city processes, technocratic explanations, a mediated hydrological cycle, nor the organisational structure and political responsibilities of governing bodies and institutions, nor can it only be found in the work and technologies that cascade inwards and outwards from the control room. It is all of these simultaneously, yet none of these categories necessarily lift out or describe the experience of sanitation, how it turns up, how it takes away, recycles and produces. How it necessarily forms a 'background of experience' which is perceived on numerous registers and through numerous sets of practices. The sanitation unconscious is an attempt to describe the experience of sanitation, its correlation with, and performance of, the city. It is a notion which sits alongside Thrift's technological unconscious, draws from it, and re-works the concept in regards to the particularities of sanitation which participate in the building of a mundane background of sanitised persons and environments.

In this approach sanitation escapes neat categorisation, is unbounded, it turns up in many spaces and places: from the water flowing from the tap, the toilet, to the ground that we tread harbouring an underground matrix of sewers and water pipes. It involves political organisation and responsibilities,

our own hygiene habits and biological processes. But to explore this environment-and-persons, as has been suggested, means going beyond physicalist and technologist descriptions of this phenomenon. There are many sets of knowledges through which sanitation 'turns up', knowledges that position, describe, order and produce differing versions of sanitation. There are the obvious physical-material networks of pipes, pump stations, treatment plants, and reservoirs and so on, which supply clean fresh and pressurised water, provide drainage, and remove effluent from households, commercial, and industrial premises. They are also political and organisation entities, involve local and central governments who have legal and social responsibilities. They are designed, built and maintained by commercial activity, are 'assets' which are insured and measured through financial mechanisms and projections. They are entangled with the 'natural' environment, mediating the hydrological cycle, altering the landscape and polluting rivers, waterways, and land. Sanitation is also, importantly, a vast set of social institutions which enable particular practices such as personal/private hygiene, secures a level of health for large populations, and in some significant ways underpins the existence of urban and sub-urban life. Sanitation is an all-pervasive background which stretches between and across all manner of physical and organisational boundaries, sets of knowledges, and practices.

The sanitisation of space

Sanitation is inherently tied up with and inseparable from *space*. Sanitation is an inherent part of what it means to be part of a city, an urban and sub-urban environment. Sanitation is inseparable from how space and bodies are produced, how the city, the body, biology, social and organisational practices, and objects and technologies constitute forms of spatial embodiments through which we come to be in and know the environment. City (what I intend by this means both urban and sub-urban environments) spaces are standardised spaces, not based on the diverse features which they hold, produce, or appear, but in the delivery of sanitation – it is the *standardisation of space through the sanitisation of space*. This is a style of standardisation because it is both replicated throughout the further spaces through which one travels, often both within a regional geography and further afield. It must be noted of course, that this is very much a 'western', advanced capitalist, form of standardisation in which populations can move between cities and find the same forms elsewhere - spaces which offer reliable and easily accessible means of sanitation: there are toilets, basins, taps, sewers, running water, drains.

These processes and objects form a basic ordering, an ensemble, an arrangement, of space, of how cities are, or at least, properly should be.

It is Henri Lefebvre who noted that space is a product, is reproducible and is the result of repetitive actions (Lefebvre et al. 1996). Of course Lefebvre is offering a Marxist analysis of space, but this does not draw away from the notion that there is a production of space: that space is constructed, manufactured, that there are processes which render space and furthermore, it is *reproducible*. This is done through workers, through 'repetitive gestures', but also importantly in association with instruments: 'machines, bulldozers, concrete-mixers, cranes, pneumatic drills and so on' (ibid, p.75). Sanitation, a particular standardisation of space which participates in the production and reproduction of cities is achieved through repetition in the sense which Lefebvre suggests, in which the distinction between what is considered 'local' - the immediate space which you or I may inhabit, (a space it must be noted which is sanitised) and the global - spaces elsewhere in which sanitation is reproduced. One cannot move in the city without the city first moving. To be in the city, to inhabit urban and sub-urban space, is not to enter a boundary, a borough or ward, a region or jurisdiction, nor is it a static or unmoving section of geography. Space is produced; it must crawl, sprawl, develop, expand, change, connect and diversify. Before a foot, a tyre, even an eye reaches this city (before it can even be called a 'city') space is transformed – through council plans, zoning, land development proposals, contracts, builders, machines, engineering, surveying techniques, landscapes designers, realtors, even temporalities. For example, to be able to flush the toilet in Christchurch is to connect with a particular 'colonial system' of sanitation. The sanitation networks in Christchurch were based upon the systems developed in Britain in the mid 19th century. This is in design and development, in practices and organisation, regulations, financing, construction methods and means of calculation. There is a movement across spaces, a repetition, a reproduction of the cities of Britain, not only in the buildings, but in the construction of the underground, the means of sanitising populations and spaces (Wilson 1989; Wood 2005).

Space, in this sense is not simply geography, it is rules, it is over-ground and under-ground, it transforms on entry and exit, through its very production it produces more spaces and geographies, it is constantly re-worked and re-made, space enables activity and is produced through it. Space, not bounded but produced and reproduced, always moving, heaving, pulsating, yet simultaneously observed as seemingly still, unmoving. What is important here is that space can exhibit 'natures' - effects which loop and link them to other spaces, objects, bodies, ideas, repetitions, effects which

echo. It is this feature of space which is key to the sanitation unconscious: that the production of urban and sub-urban space involves a particular form of *standardisation* or repetition through which diverse terrains, geographies, regions, cultures, climates and populations are made inherently urban, are 'city-like', turning up, in this respect, as expected. It is a reterritorialisation of spatialities which produce experiences, becomes a baseline set of expectations, part of what constitutes a city. It is the continual placing together, the repetitive matching of cities, populated and urbanised environments, with sanitation. The sanitisation of space has a standardising effect because it turns up this way time and time again. This relation of space and the objects is not tautological, it is an ordering through which the many objects of sanitation networks are intimately related to bodies and spaces, an arrangement, a spatial ordering which gives rise to the conception not only of space as something that is able to be standardised and produced, but also that space in this sense moves ahead of the body. In this sense, the standardisation of space is achieved through both the provision of sanitation - in a familiar form, and the acceptance of this form in use, and in repeated use over varying spaces.

Being located in this style of space means sharing a proximity with physical networks of sanitation services (and of course there are a plethora of other services which render space liveable; electricity, transport, commerce etc). It is the standardisation of urban space through sanitation, which does not mean that space, regions, areas are sanitised, made clean - although to a significant degree this is an effect - but, in terms of the provision of sanitation, the reliability and accessibility, always available, ready for use, a pervasive network which moves through all urban space. The physical ground may obscure what is a vast, constant web of continual growing, always working network of pipes, pump-stations, drains and treatment plants which move, carry and mediate fast flowing, pressurised water - both clean and dirty - through and between these spaces. This provision has direct relation to the practices which occur in these spaces. Urban and sub-urban spaces are *infrastructurally penetrated*; to enter space which does not offer such possibilities means that it does not conform to the expected features of a modern city.

So far the underlying standardisation of space has been located in the production of space, or the continual reproduction of space through sanitation. The physical objects of sanitation: the 1700km of wastewater and 1500km of water pipe-work under ground; the 120 wastewater and 54 water pumping stations which pressurise and move water and effluent across vast areas, all of which is accessed without cognitive attendance, implicated in such mundane tasks as going to the toilet, turning on the tap, or having a shower. But there are a number of further elements of spatial ordering

which lend themselves to this aspect of the sanitation unconscious. One has already been witnessed in the previous chapter – the mapping and rendering of space through digital and informational technologies. For Thrift, the standardisation of space through such technologies is integral to the constitution of the mundane and unattended aspects of life everyday life, of the background experiences which participate in the structuring of action and possibility. The control room demonstrates how 'cityness' is first is made visible, and second that it comes to be performed through the software and wireless communications which map and link objects and terrain together in a commensurable, that is, a standardised, form. Sanitation is achieved through not only this mapping of space but also through calculation, through the digital modelling of the hydrological and urban environments. Increasingly these forms of calculation and modelling are required in order to map population growth, weather systems, and local hydrological cycles in order to develop, maintain, and operate sanitation. It is this particular production of infrastructure, both in the operation and maintenance and the ongoing development and planning of sanitation in the city that resides as a core function of local governments in New Zealand. The provision and maintenance, as well as the financing, the future development and design of essential services - clean, pressurised water, liquid waste and effluent removal, storm water and drainage - are implicated and associated in, are a core part of the governmental and organisational structures which are responsible for 'managing', for overseeing the production of urban and sub-urban spaces.

Repetition and disruption

The standardisation of space involves a specific production of space through sanitation. It has been argued that this production involved 'repetitive gestures' but also reproducible objects and technologies, such as the objects of sanitation and the systems of calculation (such as the rational method), processes, knowledges, practices and machines. All of which are re-producible. Repetition therefore is an integral aspect of standardisation, in order to reproduce effects, in this case the sanitisation of urbanised and industrialised spaces and populations. The September and February earthquakes in Canterbury proved to be extremely disruptive events which surfaced the collective practices, the spatial and object relations in which a vast army of objects and things mediate and participate in the production of sanitation. This seismic activity severely disrupted the infrastructurally penetrated ground. The ground itself demonstrated itself to be a vital feature of sanitation, altering the set fall of the gravity operated pipe-lines has caused many problems for the ongoing maintenance

of the flow of effluent around the city. This disruption also highlighted the highly interconnectedness of these infrastructures: the reticulation of water requires the continued supply of electricity, and *due to the unique geography of Christchurch,* that is, the non-standardised terrain in which these infrastructures and their designs must negotiate, water is pumped up from 167 wells (rather than taken from a major source such as a river and then treated and distributed) via 54 water pumping stations throughout the city, with relatively few reservoirs and bulk storage facilities. As with water, the sewers also, consisting of 120 pumping stations which require electricity, with very few on site generators (13 in total). To circulate and move effluent in the higher parts of the city gravity lines are used, however, the fall, diameter and design of the underground network is for an optimal flow which is not possible without the reticulated flow of water and the 'normal' functioning of the domesticated population. There is a constant intermingling which permeates infrastructures, they work not as separated entities but interconnected assemblages of objects, knowledges, skills, resources, forms or organisation, politics, economies and socialities.

It is this disruption, the re-territorialisation of space, of land by seismic activity which has caused breaks, not only in the physical material networks, but in the very repetition, the production of space that is achieved. There was a sudden separation of the juxtaposition of the assumed lives of citizens and sanitation. The city space failed to perform sanitation, bodies became un-sanitised, new practices emerged, new objects such as portable toilets, chemical toilets, water trucks, anti-bacterial hand-washes, camping stoves to boil water, desalination plants, re-routed and blocked roads, all of which reconfigured bodies, practices, and city spaces. In the periods immediately after the quakes the possibilities of sanitation were dramatically altered and reconfigured. Bodies, populations could not do it alone, as singular bounded entities, nor is sanitation automatic; it is not necessarily vital or self-realising. It is precisely that sanitation is not located in a single bounded space or entity but resides in objects, in formatting, in production and reproduction, dispersed over space. The sanitation unconscious is an effect of naturalisation: an anticipation of space which is produced both in the reproduction and construction of assemblages of terrains and objects but also in the reciprocal repetition of practices. A coagulation which manifests as a non-cognitively expected arrangement of the environment we have come to inhabit.

Repetition is the performative work of infrastructure which is a vital conduit for confirming the world as 'real' as 'correct': 'When practice is established and runs smoothly without being perturbed by disruptive events, conventions of address sit there quietly in the background and "the fictional nature

of organisational knowledges does not surface easily. Everything - objects, setting, routes, people - seems to be real, that is the way things properly are, provided with a sort of existential fixedness and ontological correctness" (Lanazara and Patriatta, 2001, p965)'(Thrift 2004b, p.176). This is the sanitation unconscious, where the location and possibility of action, which is this case the possibilities of sanitation, emerge through socio-technical relations with the objects and technologies that perform sanitation. Things such as the pipe networks and pumps, the means by which a city is infrastructurally penetrated, stand in for and replace any direct human practices regarding the provision of water or removal of human waste. These objects and technologies are delegated and thus mediate the sanitary city. They are socio-technical networks precisely because human practices and technical objects are conjoined. Practices are transformed; specific sanitary practices are enabled and sustained through and in the alignment and configuration of bodies and technologies. The ongoing endurance of both sanitary practices and the sanitary city rests in the alignment of things, objects, technologies and the bodies and practices of humans; the socio-technical relations which produce and reproduce, and make durable, the city.

It is also important not to misread such an account as a form of technological determinism. It is precisely the continual production of space which enables the possibility of perceived stability. It is the performative nature of the repetition which enables stabilisation that at each point the world 'turns up' more or less as expected. Of course any model which assumes a standardisation of space, is one which recognises that this form of space is continually produced, that it is not a static or stable entity but is a form that is juxtaposed with other forms - that of the city - and furthermore, an acknowledgment that not all urban spaces adhere to this mode of existence. Graham and Marvin (2001) demonstrate the 'splintered' aspects of the modern urban form, where the emergence of infrastructures take differing forms, developing and fracturing spaces along less clear lines. That infrastructure may run through cities, does not mean all have access. The very processes of development and movement of infrastructural logics work in ways which radically alter and fracture urban spaces; they continue to entrench inequalities, manifest the political and commercial interests, and perform changes in landscape and proximity.

The Canterbury earthquakes demonstrate the vulnerability of this process of repetition. Interruptions to infrastructure produce cascading difficulties in managing space, maintaining cities and securing sanitary practices. The very ground, the landscape is deterritorialized and reterritorialized by and through disaster - and thus space, and the particular standardisations of space through sanitation are

re-worked. Disruption re-assembles the city, interrupts the performance of sanitation, breaks repetition and exposes the vulnerability, not only of physical objects, but also the ordering and arrangement of people's lives and everyday practices. The possibilities of health, of maintaining sanitary practices in the absence of flowing, clean, fresh water, are made increasingly difficult. People must queue on street corners in order to access water supplies - water that needs to be boiled before drinking. Toilets cannot be flushed so the removal of excrement takes on new practices and objects, portable toilets on the street, chemical toilets which citizens must empty themselves into waste collection points, 'dunnies' are constructed in back yards. The very possibility of personal hygiene and the privacy which this assumes are dramatically altered through disruption. Antibacterial hand wash becomes of considerable importance to authorities and households and there are concerns by health authorities that bacterial diseases will increase. New objects and infrastructures are deployed in order to re-produce, albeit differently, sanitation, temporary infrastructures in which space is re-territorialised by sanitation networks of portable toilets, chemical toilets, waste collection points, boil water notices, milk trucks transporting water supplies, buckets, anti bacterial soap, health warnings. New ways, new practices, and new objects are utilised in order to produce, or at least to some degree replicate the circulation of liquids through and across the city, and the attempt to enable sanitary practices in the absence of the objects, the processes and operations of the infrastructures which enable the performance of a sanitised space.

The city and sanitation as circulation

> The town is the correlate of the road. The town only exists as a function of circulation and of circuits; it is a singular point on the circuits which create it and which it creates. It is defined by entries and exits: something must enter it and exit from it (Deleuze & Guattari 1997, p.313).

In this sense the city is a correlate of sanitation. This is a circulation which involves the drawing out and movement of fast flowing (pressurised) water, the removal of effluent, and the flow of surface water through drains, gutters and pipes. The *city is circulation* and sanitation provides part of this circuitous 'nature' in which there are continual entries and exits; movements across, between and within the city. This specific character of sanitation, of constant flow, of circulatory movement of water and waste across and through space is part of the production and standardisation of space.

This requires a vast lattice work of pipe work, armies of pumps and generators, reservoirs and tanks, maps, engineering, expertise, finance, politics, and scientific knowledges, the alignment and arrangement of these technologies, objects, and processes, which enable function, which enables the possibility of continual movement across space, into toilet cisterns to be used indiscriminate of time or place, the movement of water from tap to sink, into pot or glass, from the shower head and into the drain. Constant entries and exits, water drawn from underground, pumped through pipes, flowing through filters, valves, reservoirs and tanks, junctions, taps, hot water cylinders, hosepipes households, factories, buildings. Carried away through drains, flushing toilets, urinals, gutters, pipes, pumps, treatment plants, ponds, spread over land, flowing into rivers and waterways, deposited into oceans. This is a flow which permeates our lives in very intimate ways: from drinking water to cooking a meal, to flushing the toilet and washing. There is a circuitous flow of water around our bodies, the entering of clean and exiting of the dirty, the effluent and waste. There is interconnection, the provision of clean water proceeds and requires the continual removal of the used, dirty, waste: in Christchurch for example, only 20-30% of the water provided is consumed with 86% of wastewater being generated domestically (CCC 2011d). It is this continual flow which mediates sanitation, which structures and forms the habits of health, wellbeing, and simply existing in urban and sub-urban space. There is movement across terrain and landscape from underground to over-ground, across land and water. Pumped from the deep recesses under the earth, the natural aquifers formed underground, to produce an uninhibited flow from a tap, only to return underground again, in sewers, which usher this waste across and through the city again.

This is not a closed system: the built environment of urban and sub-urban landscape, the impervious materials which line the roads, footpaths, numerous structures and roofs mediate hydrological processes. Precipitation, evaporation and infiltration – the 'natural' cycle of H^2O - the movement and cyclical processes of water molecules are altered (Illgen 2011), reorganised by and through the city: water channels, storm-water drains, culverts, sewers, flood plains, catchments, rainfall calculations, ecological modelling, all become inherent and essential systems which mediate populations and environments (Butler & Davies 2004). It is this mediation of the natural hydrological cycle which performs a sanitary function in the city by creating flow and directing water away, underground, elsewhere (see figure 8). Storm water networks are one aspect of sanitary circulation. A needed flow in order to avoid the flooding of urban and sub-urban areas, to disperse stagnating pools of surface water which become sites of disease and ruin safe water supplies.

Figure 8: *A diagram from a technical manual depicting the mediation of urban drainage between people and the environment. Source Butler & Davies (2004, p.1)*

The circulation of water and waste, and the sanitisation of urban and sub-urban space in this respect are not 'natural'; the urban environment is held in contrast to 'nature' (Kaika 2005) as distinctly separate, altered, densely populated, industrialised, commercialised, manufactured and produced. This modernist conception of cities is increasingly changing to consider urban and sub-urban environments as natures themselves, along with a questioning of what it means to be 'inside' and 'outside' of these spaces. The circulation of liquids demonstrates the entwining of the ecologies of built environments and that of nature, with the flow of water - a quintessentially 'natural' element - funnelled through city spaces, with altered and mediated hydrological cycles, with micro weather patterns. However, this 'double scripting of city and nature' (ibid, p.15) still highlights that the built environments of cities are inherently different, and a specific difference which suggest they are manufactured. The emergence of the city, of urban and sub-urban space, in fact *creates flow*, but simultaneously, the city is also created and produced through this circulation.

This circulation is not limited to ecologies and the intended functionality of sanitation. Sanitation, as our time in the control room demonstrated, relies upon the circulation of data and information. This is done through wireless communications links, software and code, cables and wires, processors and monitors. This is no less constant than the very substances being circulated underground. Perhaps, for those in the control room, the stream of information being exchanged, the flowing back and forth of data, in terms of immediacy, is of greater importance, certainly more relevant. Here the city is the correlate of sanitation and circulation correlates to data. In the control room, the city and sanitation are conflated; to see the city is to see movement and circulation generated through sanitation infrastructures. Maintaining circulation and flow are the primary responsibilities, ensuring constancy. There is no beginning and end, there is just circulation. Redundancies are inbuilt; the very characteristics of flow, the rate, the fall, the volume that pumps can push and pull through pipes, even the calculated total peak volume of populations are theoretically calculated and physically built into the hardware. The capacity and speed of processing waste at the treatment plant must be able to match the production of waste by the city.

This movement, this means of circulation which performs and produces space was severely disrupted by the earthquake. Wells and pumps were damaged, disabling the flow, the entry of fresh water in the eastern suburbs. Taps no longer the simplified objects out of which clean fresh water flowed. This came to be replicated through the movement of trucks throughout the city which would drop off water. A desalination plant was put in operation, mobilised by the movement of troop and army personnel into space. Waste, effluent circulated over ground, deposited into portable toilets which were continually distributed throughout the city; emptied by sucker trucks which would then move this detritus by road to the treatment plant. Health messages were circulated; boil water notices traversing the internet, across the landscape by radio waves, delivered in newspaper vans. The interrupted circulation enabled through the socio-technical networks saw the movement of populations. People would cross town in differing patterns. Aid, health and welfare workers advanced east to help the worst stricken suburbs. Many moved west, to friends, family, to households and rentals which could offer the renewed use of these sanitation networks. Businesses and commerce migrated across, and at times outside of the city. Post February Christchurch unavoidably became a 'tale of two cities', a tale of a city divided, not necessarily by the over-ground effects of the earthquake but by functioning of sanitation networks which reside, at least physically, predominantly underground.

The co-evolution of the sanitary city is a form which has become a set of 'guaranteed correlations' (Thrift 2004b, p.177) which produce spaces in which relations and practices emerge, become naturalised, anticipated: 'environments of which we are part gradually come to be accepted as the only way to be because, each and every day, they show up more or less expected' (ibid, p.175). The emerging effects of the correlation of sanitation, city, are the spatial relations which entwine our bodies with environments and produce possible sets of actions, modes of operation which are enabled and occur. An expected set of conventions comes to attest to the world as stable, natural, part of a vast and un-noticed background; a background which enables the form and possibility of knowledges and actions, practices which are not located exclusively in space, the body, or the environment, but in the co-evolving socio-technical relation which participate in the building of sets of automatisms produced in the correlation of sanitation and spaces, enabled through the processes of production, repetition and circulation.

3.3 The re-configured body

It is in the correlations of sanitation and spaces, between technological objects and bodies through which knowledges about the world emerge; there is a production and transformation of space which configures bodies and body practices. It is the co-evolution through which spatial and object relations emerge and act upon one another, configure and re-configure, form assemblages, in this case, assemblages of sanitation which significantly, vitally, bear upon our relations to and in the world and the means and style of actions that occur. The sanitation unconscious is an exploration of how a sense of stability is achieved, where 'complex ethologies of bodies and objects' (ibid, p.175) emerge as 'black boxes' (Latour 1999) through the achievement of performative repetitions: the world continually turns up as expected not because this is a 'natural order' of things but because it is repetitive and performative. It is in this sense that the world comes to be known less significantly through the processes of cognition or conscious thought and thus intended action, than through practices which emerge out of socio-technical relations.

The sanitation unconscious however, is not bounded to the body, nor limited to exclusively human inter-relations. It is a background experience, part of the 'basic conditions of life' but one which is inherently accompanied by a vast multitude of heterogeneous entities. Demonstrated in the control room was the amalgamation of human and non-human as sets of social-technical relations that enabled a number of the infrastructural networks - primarily those related to sanitation - to not only be seen but performed as part of the city. Any notion of 'performance' however, also brings Erving Goffman to mind. Sanitation can be considered a multitude of 'backstage' performances (Goffman 1971) both in the individualised and private practices such as washing ones' body, personal grooming, or going to the toilet. Washing and personal hygiene for example can be included in the repertoire of actions by which the individual is able to present oneself. But this is done behind closed (and often locked) doors, in private spaces. Going to the toilet is certainly not done in public as a front stage performance and collectively, there is an inherently accepted, if not entirely enforced practice, of relegating urination and defecation to private and backstage acts.

Furthermore, sanitisation of the city is also a 'backstage' performance which is done via restricted spaces, closed off buildings, gated structures and underground pipes where only a privileged few have access, have knowledge of, and can witness how this performance occurs.

Excrement is ultimately made invisible; at no time during my tour of the physical networks which support the city's sanitation did I encounter this substance of disgust. If we continue with Goffman for a moment longer, or Michel Callon's (Callon 1998,1999) re-working of Goffman's frame analysis, the practices of sanitation - the action and interaction which takes place - can be seen to be structured by the very entities and objects involved. The objects (and processes) of sanitation participate in the framing of action and experience. However this is not a frame which tightly bounds and contains action which occurs between humans independent of the wider world but can be seen as assemblages which participate, objects which can act both as structuring action but also are conduits for interaction with the wider world - these are 'overflows' that 'represent openings onto wider networks, to which they give access' (Callon 1998, p.8). They are both solid, physical objects, but also are relations, actors, participating in the building of new 'human natures' (Thrift 2004a, p.146).

The sanitation unconscious means that the experience of conscious awareness fades as a privileged form of agency, intention, perception and movement. Thought and action are *not separate from the body or the world* but complexly constituted through and by them, there is a folding into each other. It is through the processes of movement and action that we come to know the world, that the world in which we are implicated becomes known. 'Non-cognitive thought' as Thrift (Thrift 2000,2004a) calls it, offers up a map, a representation of perception which has occurred through many different registers: the senses, the viscera, and the emotional, all of which are present to some degree in the unconscious experiencing of the world. It is in this sense that the body, and the movements and practices encountered through the body, that orient our cognitive attendance or un-attendance to, our knowledges about, and thus the possible sets and sequences of actions in the particular environments we find ourselves. It is the sanitisation of space, the repetitive performing, and sanitation as circulation and flow, which comes to effectively build a familiarity, an anticipated background which is critically implicated in the daily functioning of our lives.

The sanitisation of our bodies does not occur simply because we become located - this however is a significant part of it - the sanitisation of space offers possibilities for movement and action which otherwise would not be possible. Objects of sanitation work to configure our bodies, to sanitise them, connect others, to the city. The sanitation unconscious is a material orientation as much as any sense of embodiment: It is where the body jumps out of its skin, stretches beyond the 'body image' (Gil 1998) and is entwined, intermixed, and entangled with the functioning, knowledges and objects

through which sanitation occurs. The standardisation of space is a standardisation of bodies not through the bounding of bodies but the de-centring and reconfiguration of them, enabling a bed of practices, offering possibilities for action, logics, experiences, an ordering of what is known as what and how the world is. It is precisely the multiplicity of spaces and relations of the body where 'being in space means to establish diverse relationships with the things that surround our bodies' (ibid, p.127), particular 'exfoliations of the space of the body' which are attuned to certain spaces, parts, and organs of the body. Going to the toilet is a prime example of such 'exfoliations' where the body is configured through a specific management of the senses and a privileging of the visceral. A number of primary perceptive senses: vision, smell, and touch, are reduced, muted, made secondary to other bodily functions and parts: the normally primary perceptive senses to a significant degree are rendered redundant, marginalised from the function of waste production, made secondary to automatisms which belong to the viscera – the bowels, the intestines, the processes of digestion, and the first order parts being those directly associated with expelling our waste: the rectum and anus.

Formatting and competencies

I want to stay with our re-configured, waste producing bodies for a moment longer. The sanitation unconscious is not a form of technological determinism in which humans become thoughtless drones to the very technologies which have been created, nothing so imaginative. It is the possibilities and actions afforded to us through these devices which enables life to move along – the sanitation unconscious, in part, has an effect - precisely because being located in a particular form of space, bringing us into relations with processes and objects - of releasing our conscious capacities. Says Latour: 'I'm neither in control nor out of control: I'm formatted'. There are formed competencies, sequences of action through which the 'conscious I' is a 'light, agile and inexpensive actor, but one that's sufficiently linked to circumstances to be able to import the competencies required for a sequence of action...' (Latour & Hermant 2006, plan 33), the sequences and competencies are also spaces, bodies, configurations, and assemblages that privilege certain body parts, demand certain skills and require specific knowledges of what, where and how, formatting action and movement through the allocating and negotiating of identities and capacities from moment to moment.

Formatting occurs much through the use of devices which standardise and direct action. They are objects, things, means of structuring, producing, and designing competencies – possibilities and

sequences of action, regimes of intelligence. A porcelain bowl, the design and shape emerging over the centuries (Palmer 1973; Wright 1960) fitting the generic contours of a modern backside, the *gluteus maximus modernis*, while we sit down to expel our waste. But before we are even seated, even in this private space, before our trousers are unbuckled or unzipped, dress or skirt hitched, we first must make our way to these spaces. Rather easy in our own home or in familiar places. In an unfamiliar home we may have to ask, will be given an instruction, a verbal map 'down the hall, second on the left'. In larger places, malls, large buildings, we are readers and interpreters of signs and followers of directions. We do not need to carry maps in our heads, pockets or handbags; we are directed by signs, pictures, arrows and verbal instructions. But there is also the competencies achieved as a law abiding (see the Summary of Offences Act 1981) and sanitised citizen - that we do not simply urinate or defecate anywhere, but seek out designated places provided specifically for sanitising the body - toilets. It is the very sanitisation of space which enables such a competency, such a *style of citizen* in the first instance (this is not a natural or universal 'style' for e.g. one may be able to witness defecation in the gutters or streets in areas and cities without access to sanitation networks).

Toilets generally will be proximate, accessible, and appropriate to the structure and volume of people (see The New Zealand building code), by which commercial enterprises, residential properties, factories and municipalities ensure that we remain law abiding and sanitary citizens through the provision of public amenities, which also ensure continuing privacy, in the many spaces and places in which we may find ourselves. We do have to search them out (they are often hidden 'backstage', folded into buildings, into spaces, the structures which house toilets taking on an exhaustible variety of forms) by reading and recognising signs –often gendered signs through which in a split second we identify particular aspects of our anatomy and match this with a symbol or sign - which direct us there: we are ushered down corridors, hallways, turn corners, venture up or down stairs and enter small rooms which we often refer to euphemistically.

If we have made it thus far, we have entered a cubicle or a toilet room, suddenly we are an individual - there is little room for more than one - we have also become private individuals, locking the door. Once our individuality and privacy are taken care of they are immediately forgotten, now we are advised to sit, not by choice but by porcelain design - a particular 'western' design. If one possesses a penis then standing can be negotiated, in fact, there is a choice presented to the possessor of male genitalia; the private cubicle or the urinal. Urinals can come in a large number of designs, some which assume a particular height which excludes small children, some more private with individual bowls and

dividers, others more public in which people line up together. Some even have insect decals positioned in the bowls (which look surprisingly realistic) in order to help direct the often splash prone or ill directed aim of the expelled urine. Suffice it to say, that although there is a generic similarity in what is required by a urinal - such as standing for example and therefore excluding some sections of the population, such as those confined to wheelchairs, there are many variations in design, material, construction and placement.

If it is the bowels and not the bladder that is directing this sequence then we are required to have a rather generically sized rear end and be of a generic weight. We are compelled to sit, to face forward; the senses are muted, obscured from the process, while the bowels, the rectum, the anus, are given privilege. It could be said that our sanitary habits are not at all private, but crowded affairs in which our bodies, body parts are surrounded with objects and formatting devices. Slajov Zizek (2011) claims that the differences between European styles of toilet exhibit different regimes of thought, differing ideologies which are woven into the very physical structure and operation of toilets.

The intimate practices of sanitisation are enabled through competencies through the alignment of bodies and objects, specific arrangements which guide our action. We do not carry complete sets of maps and sequences in order to be sanitised, this is afforded through the spaces in which our bodies become located, with devices and objects which body parts are aligned to, offering possibilities and format actions, and possible encounter ideologies. These are automatisms which carry very specific information; they format action not through the cognitive capacities but through the reassembling of bodies, body parts. From moment to moment we are aligned and re-aligned, in which competencies are allocated, asked for, given and taken. The objects themselves do the sequencing and formatting, leaving the conscious self unfettered: the objects do the thinking for us.

Despite the private spaces, cubicles and locked doors, this is in no way an individual moment. It is a crowded affair in which bodies are surrounded by objects which oversee and guide our actions. Sanitation starts far before we enter the toilet and furthermore, it does not cease once we exit. The expulsions of our bowels and bladders are not single events, moments of sanitation, it is not the single personal habits of hygiene that are of concern to the sewers. The concern is for many individuals, populations, engaging in waste production caught in a torrent, a flow in which the bowels of the city intermingle and circulate; the production of waste forms a life of its own. This is also a crowded affair because there are many watching. Far removed from the toilet room you inhabit, there are those

sitting in the control room who are watching this water use and waste production. Not the individual habits, but they, alongside the objects of sanitation - the pump-stations, wells, reticulated water lines, and so on - and of importance here, the wireless communication technologies, the software, the cables, the processors and monitors through which this use and production can be 'seen'. Through this mapping of 'the city' the circulation, the processes of sanitation are enabled and maintained. The process of sanitation correlates to output, the population engage in waste producing activities at particular times throughout daily, weekly and seasonal periods - to produce flows. It is the maintenance of this *collected and collective* flow which must be accounted for. It is this particular rendering of the city by which sanitised space is monitored, by which it is able to continue uninterrupted, the continuous circulation, the constant movement of clean water into the drains, downs sinks, flushing toilets, doing dishes, washing clothes: the domesticated citizen.

It is the proximate and contiguous objects of sanitation that guide and align with the body: the cisterns which hold water, the toilet pan or bowel filled with water and thus reducing odour, the toilet seat in which we sit and face forward, the flushing mechanism in which one movement effects the disappearance of our effluent, the shape, the size and configuration of the plumbing, and the vast network of pipes which immediately carry away the waste and dispose of it without any further action or thought from the user. The body is ushered into a sanitised state. It is the work of software and digital technologies which enable the seeing of the city, the monitoring and maintaining of flow, continually re-producing the sanitised space. The domesticated citizen does not appear as an individual, it is volume that is of importance to these pipes and pump stations, volume and temporality - the *how much* and *when* of faceless, heedless, non-specified, indiscriminate population - the use of water and generation waste as flow. A production of space and flow which stretches over the entire city, where the body is directly plugged into the sanitation networks of the city, this enormous, throbbing, pulsing, pumping network, through which waste, effluent moves with a viscosity that is matched, built into and around the very pulsing of human activity, the stops and starts, the breaks and cycles, the peaks and troughs and all in between. The life of waste, of effluent, the repulsed, the dregs of hygiene and industry, pulsate with living flow.

Chapter 4

Sanitation, liberalism and emergency rule

4.1 Matters of concern

So far you have encountered cyborgs in the control room and the sanitation unconscious. But now we are no longer sitting in the control room, nor traversing the landscape following the networks of physical objects and spaces of the city. Of course, these other visibilities and concepts are never absent from the following account. They are implicitly part of it, are complicit in this chapters' making, the placement of the previous chapters a purposeful act in the construction of this document. What makes this chapter altogether different, however, is the change in scale and means of visibility. It was at the end of chapter two, in the control room, that I considered the visibility and scale afforded the shift controller. The ability to access and move across scales is afforded to me: that observations and descriptions, concepts, methods, ways of seeing 'the social'; regimes of visibility are constructed through particular method assemblages where I am able to observe, to read and think upon, index, categorise, analyse, describe and inscribe, move across scales and temporalities.

It is in this chapter that I attempt to turn, and make visible, the question of *politics*, and more specifically the question of politics as it relates to technologies and governance. In the broader sense the relation between politics and technologies is a complex set of histories. In this chapter I am not interested in a sweeping set of explanations regarding this relation, but will look at the question of politics that arises in the specific case of the controversies which emerge from the disruption of sanitation networks and land, in post earthquake Christchurch. First this 'politics' needs some qualification: not political with a capital 'P', not a politics that is constituted by 'naked citizens, unable to speak all at once, arranged to have themselves represented by one of their number'(Latour 1993, p.143), a parliament of exclusively human representatives. No, this chapter seeks to explore the city, the government, sanitation and land as a 'parliament of things' (Latour 1993): a space in which political representation includes the very objects and things around which disputes gather. The politics of people is the same as that of the pipes, pumps, land, earthquakes - the things - around which the disputes, divisions and unifications occur. Latour posits this as a non-modern constitution which dispenses with the 'phoney dualisms' (Lash 1999, p.269) of modernity which erases the role of

mediators, hybrids, technologies, objects from the constitution of the social. This is a rejection of the distinction between political representation in terms of society and that of epistemological representation or delegation of objects and nature to the sciences (ibid, p.269). In short, this is a call for objects to be granted political representation: an object oriented democracy, a 'parliament of things'.

What would this parliament of things, a 'Dingpolitc', an object-oriented democracy look like? This is a question which Latour (Latour 2005a, p.14) asks. The answer: things, as well as humans, must be able to speak, to have rights, to be represented in the same way that humans are able. This is not a democracy made up of, or by, things, technologies, objects, but a democracy in terms of representation, so that any consideration of the 'social' does not exclude the role, the agency, the participation of objects and technologies in the very constitution of society. In Latour's (1991) own words 'technology is society made durable'. The question of politics then has a double meaning: first, that objects and technologies - non-humans - be allowed into any consideration of what constitutes society; and second, and importantly also for this chapter, that any object oriented democracy is not a form of technological determinism, that representation of objects and technologies follows the style of representation that is afforded humans. The corollary, particularly for this chapter, *is a politics of things which interrogates politics*. To put this in an alternative way this is a question in which politics is about the movement from *matters of fact* to *matters of concern* (Latour 2004b,2005a). Politics is a gathering of many, both human and non-human, an assembly of so many issues, of controversies, processes, technologies, devices, objects, a gathering around matters of concern in which so many entities are thrust together. It is things, in this case urban infrastructures - the pipes, the pumps, the drains, wells, and the land in which they are buried - that are embroiled in these political assemblies. Such assemblies, or 'gatherings' come together *around* objects and technologies, they are at the centre, not the periphery, of division and dispute, they are the controversies, they are at the very centre of the political.

It is in this sense that 'objects' lose their clarity, their definition, their disentangled and purified categorisation of solid, discrete objects: objects lose their 'matter-of-factness' (Latour 2005a, p.23). No clearer example of this movement from matters of fact to matters of concern, involves the movement of the Pacific and Indo-Australian tectonic plates. The September 4th and February 22nd earthquakes in particular but the entire 'earthquake sequence' which to date includes thousands of quakes in or near the region of Christchurch. The matters of concern in 'post quake' Christchurch lie directly upon fault

lines created from the movement, tension and fracturing of these two plates which mark a geological divide in the South Island of New Zealand, causing ruptures in the ground underneath parts of Christchurch city. The matters of fact pertaining to the functioning sanitation networks, pertaining to the stability and reliability of the very land, and the clear lines of definition between what is the 'city' and the 'state' are transformed into matters of concern through disruption. Seismic disruption, not only moved the very earth upon which our feet are grounded, but also the basis by which *matters of fact* have grounded the intimate practices of our lives.

The 'black boxed' objects of sanitation, the black boxes of infrastructural networks, up until the seismic events (beginning on September 4th 2010) would be considered by many as matters of fact. In its functional certainty sanitation networks in part held the city together, mundane and taken for granted yet vital and central to the make-up of our everyday lives. It is disruption which enables a focus on matters of concern, to a politics of things. A city is undone, networks and systems fail, infrastructures are damaged and destroyed, land and buildings heaved and shifted. The ordering and alignment of people and objects, the means by which cities are at some level or degree able to be an object, to display and perform city-ness, is violently shaken and ruptured. Along with the unearthing of pipes and pump stations there has been an unearthing of politics. Questions of politics and governance, questions that always inherently regard objects, have surfaced with the very sewage which spilled out of the broken pipes and shaken ground, into streets and back yards.

Sanitation does not simply reside in the present moment, but stretches over temporalities: over histories and spaces, involving inventions, transformations and developments, processes, ideologies, issues, controversies and contingencies. All of which come to form the objects and practices which surround, and are, sanitation. In the development of 19th century urban sanitation Patrick Joyce (2003) locates a particular form of material liberal governmentality, one which focuses not on an 'idealized schema' of rule, as 'an act of will' but in the contingencies, the complexities, the assemblages of human and non-human agency which effect, change, produce and participate in the emergence of particular forms and dispersion of power and governmentality:

> Clearly, political reason and its techniques cannot be mapped by orthodox means as the conscious implementation of clearly thought-out schemata of governance. If forms of power and human agency, and of bodily competence and of knowledge, are carried in the material world, and in the use of objects conceived as practical epistemologies, then a narrative of

> liberalism as the term is conceived here would need to follow this strange and complex history of objects and material processes (Joyce 2003, p.98).

Patrick Joyce explores the particular emergence of sanitation as an historical form of object mediated governance, the rationality of which cannot be found purely and squarely in the ideal and exclusively human realm of politics and government but in the deployment and agency of material objects. The deployment of these objects - which gradually came to form networked urban infrastructures - constitutes and demonstrates a particular form of the political - what Joyce terms the 'rule of Freedom': the 'active and inventive deployment of freedom as a way of governing or ruling people' (ibid, p.1), enabled through the specific configurations and agency of technological and material forms which participate in the process of social ordering. The deployment of materials and technologies in the form of sanitary sewers and piped, clean, fast flowing water, for Joyce, is a technique of rule, a particular 'liberal' governmentality exercised and secured by and through the development of urban infrastructures which embed, facilitate and normalise certain forms of life in the modern city (Carter et al. 2011; Otter 2007). Patrick Joyce argues that the engineering of objects of sanitation - emerging from the 19th century onwards - were *techno social solutions to political concerns*. Pipes, pumps, sewers and drains were a material, 'objective' solution to the problem of political intervention: before urban sanitation was a certainty, a contemporary matter of fact, it was a matter of concern. It is the narrative offered by Joyce: that the particular configuration and deployment of material objects in the development of 19th century sanitation enabled and secured 'liberalism'; that I want to utilise and rethink in regards to contemporary post earthquake Christchurch.

The emergence of these objects of sanitation which mediated the sanitary practices of city dwellers, citizens, and populations, demonstrated liberalism in two ways: first, by establishing a 'political division between the public and the private' secured through drains, pipes and sewers, which enabled the possibility of the circulation of water through the private home, and importantly the removal of household slops, effluent and household liquid waste. Through such material infrastructures regulation of household sanitary practices could be secured and compelled without recourse to direct governmental intervention (Joyce 2003; Osborne 1996). Secondly there was an emerging focus on spaces; disease and ill health became located with particular spaces within the city rather than an issue regarding the individual or individual household. Lack of sanitation came to be seen as a causal factor of disease in particular spaces and places of the city, and the relations of specific groups and populations within and to these spaces. Disease in this respect was 'de-pauperised' and thus not an

aspect of poverty or morality, and de-individualised showing a 'clear displacement of political concerns from persons to places, the locus of disease now being found in the places of the city, in the details of its streets and the inner recesses of its houses' (Joyce 2003, p.67). It is in this way that the interplay of city spaces and the individual citizen, the divide between the private and the public, were political questions, 'problematics of rule', these were matters of concern through which populations and individuals were divided up and brought together, and by which cities and spaces are constructed. The securing of both became the concern of the city as a territory, a series of spaces, and the physical objects of sanitation, through which the spaces of the city were worked out.

The sanitary city emerged with the material objects of sanitation which enabled the sanitary conduct of citizens and the sanitisation of city spaces without direct governmental interference. Sanitation came to be performed through the latticework of pipes buried underground, connecting households and political concerns, and ultimately relegating the responsibility of sanitation on the self regulating (and thus liberal) subject. Sanitation, or the sanitary conduct of the individual, was a matter of concern out of which techno-social, or techno-politico-social, solutions enabled through the agency of the specific configuration of material objects. This was an agency which provided a 'distance' between the city as a governing institution and the individual citizen. It was this material change which brought together and divided populations, afforded possibilities and shaped sanitary conduct in the urban environment, mediating relations between governing institutions, individuals and households. Urban sanitary infrastructures were the material objects which helped usher in, secure, and mediate the city as particular political - liberal - space: a place of free circulation, free from disease and importantly the citizen as the free, self regulating subject, free from governmental interference particularly in regard to compelling and maintaining health and staving off disease.

There is a further point to be made. The deployment of 'liberal technologies of government' cannot be considered a straightforward entailment of a liberal political rationality. That is, 'the rule of freedom' the particular liberalism afforded in 19th century Britain does not belong to the ideologies of political institutions, was not the exclusive preserve of humans, but emerged and was afforded through the configuration and alignment of people and things. In fact Joyce sees political rationalities in terms of the technologies and programmes of government:

> This is not a matter of the implementation of idealized schemata in the real by an act of will, but a complex assemblage of diverse forces (legal, architectural, professional, administrative,

> financial, judgemental), techniques (notation, computations, calculation, examination, evaluation), devices (surveys and charts, systems of training, building forms) that promise to regulate decisions and actions of individuals, groups, organisations to authoritative criteria (Rose 1996, cited in Joyce 2003, p.3).

Latour has used the term 'gathering' (2004b) to describe 'Things' as opposed to 'objects'. Sanitation then is a gathering, an assemblage, of many technologies, entities, artefacts, devices, techniques, and people, around particular matters of concern. Liberalism, freedom as a technique of rule, was not decisively or clearly actioned as a direct consequence of a political rationality but was to a significant degree an effect enabled through the technologies of sanitation that came to be deployed. Furthermore, and of vital importance, the very assemblage of sanitation was gradual, uneven, geo-politically diverse, at times contradictory in approach and often contentious (as well as expensive). The outplaying of sanitation in 19th century colonial Christchurch, for example, displayed both a liberal reach with the attempts to construct sanitary sewers, and a concern with policing individual conduct through direct governmental intervention. Underground sanitary sewers, at this time, were not common sense or a certainty and the development of such was highly contested by the very citizens (or at least male ratepayers) that they purported to help. Concern for reducing the very high rate of preventable death and disease in the settlement was approached unevenly, with the enactment of policing individuals and household sanitary practices by health and nuisance inspectors, during the same period as the development of underground sanitary sewers (Wilson 1989; Wood 2005). This demonstrates tensions between differing political rationalities, a tension between policing and surveillance of individual practices and the liberal techno-social solution of deploying the anonymous, undiscriminating and invisible pipes and sewers in order to shape and compel sanitary conduct (Osborne 1996).

Liberal governance came to dominate precisely because governmentality shifted from being concerned primarily with policing conduct to the construction of urban infrastructures, sanitation, as a matter of concern, became the realm of engineering with the eventual widespread deployment of material technologies such as sanitary sewers, which distributed and secured particular forms of agency and practice: both for the city in regulating city wide sanitation and mitigating disease; and for households and citizens whose sanitary conduct could be individually pursued and self-regulated. In the case of sewers, storm-water drains and fresh, fast flowing water, this was a particular liberal agency enabled and distributed across urban, densely populated space, through sanitation

infrastructures: cleanliness, circulation, and the absence (or at least a vast reduction) of disease. The infrastructures deployed in the material form of pipes, drains, sewers, pump stations etc enabled the possibility of a 'sanitary city', a particular form of urban space in which the possibilities of conduct of the city's inhabitants were enabled through material objects.

A brief turn toward the temporalities and histories of sanitation contributes to an *un-explaining* of the 'present day certainties' through which sanitary practices are situated. It is in this sense that we inhabit a world of historical artefacts that have become so pervasive, so common sense and familiar. The historical emergence of sanitation, as material infrastructures assembled in particular forms, enabled the possibility of liberalism: liberalism through sanitation, where the objects and technologies literally become 'liberal infrastructures', affording a particular form of social ordering. These liberal infrastructures which mediate and participate in the everyday sanitation practices of citizens lives have become 'objective': they come to possess a naturalisation, a second nature, take on an unquestioned position as part of the conditions of urban life.

To speak of matters of concern is to become re-acquainted with objects of sanitation in the context of contemporary Christchurch. The physical networks of pipes, sewers, drains, pump-stations, gutters, wells, treatment plants, the organisation, maintenance, planning and design of these 'large technical systems' (Coutard 1999), as well as the 'private' objects of toilets, sinks, taps – all of these artefacts, although seemingly objective, independent and apolitical, present a particular model of politics; they are 'liberal infrastructures' by which particular forms of governance, as Joyce argues, a particular 'rule of freedom' is able to be secured and played out. The very structures and objects which have come to perform sanitation for the contemporary city carry not only water and waste, but a distinct logic of the 'natural' state of the city. That is to say, one does not shit and flush in an ahistorical or apolitical manner. Such material objects, and thus, the political rationalities which come to be performed and mediated through them, have become invisible. The objects of sanitation (at least previous to the earthquakes) are physical and political certainties. The political, the matters of concern, now imperceptible; sanitation is no longer a matter of concern but a matter of fact.

4.2 Durability, maintenance, and repair

The seismic events in Christchurch's caused varying degrees and forms of damage to the sanitation networks, ranging from cracks in lines, collapsed pipes, joint breakage, loss of gradient in the gravity operated mains, and pipe blockage from liquefaction. Seventeen percent of 1700km of wastewater pipeline across the city has been damaged in some way, with 20% of the Gravity operated lines being damaged (SCIRT 2012). Eight wastewater pump-stations need to be completely replaced with a significant number sustaining some form of damage (figure 9) and the wastewater treatment plant sustaining damage and unable to process at full capacity. Through the many forms of damage the functioning of city wide sewage collection was, and still is in some part of the Eastern suburbs, severely interrupted (figure 10). For a number of reasons, including the size of the pipes, the reliance on gravity, and the age and design of the materials[6], the sanitary sewers in particular suffered significant damage, far more damage than the other city owned infrastructures such as the storm-water and water provision networks. The condition of the sewers after the earthquakes and the ability to continue functioning has been one of the most pressing and on-going problems for the authorities, both immediately after and many months (and years) on from the 'Canterbury earthquake sequence'.

Figure 9: *Left hand side, the Palmers road water pumping station un-useable because of large cracks through the centre of the structure. Right hand side, the no. 28 wastewater pump station in Avonside, has been thrust out of the ground. Source: personal image collection.*

[6] Some of the sewers are still of the brick barrel type, remnants of the Victorian age. These are numerous types of pipe size and material ranging from the more modern PVC, to cast iron, brick barrel and concrete.

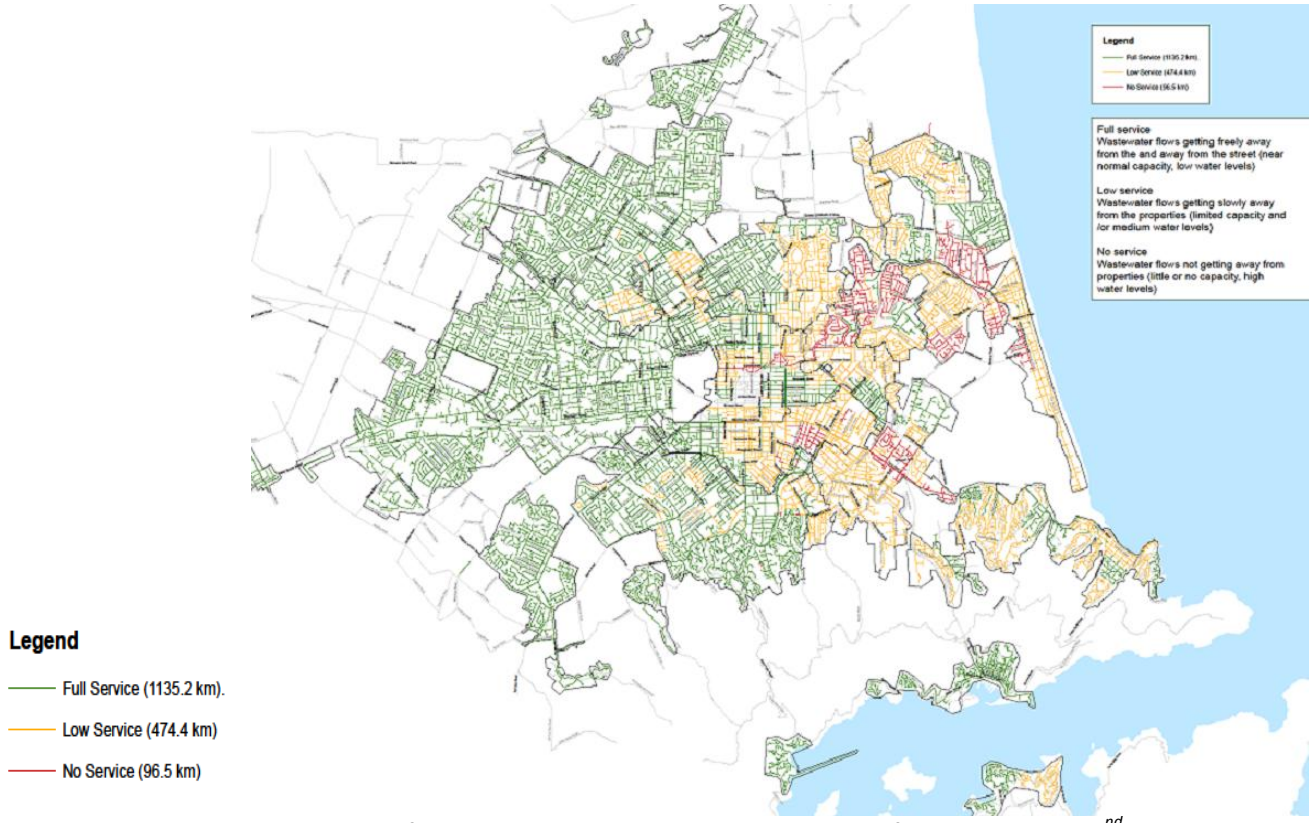

Figure 10: *This map show the extent of wastewater collection services one month after the February 22nd earthquake. The green areas are full service (near normal capacity) the yellow is low service (wastewater moving slowly away from properties) and the red is no service (wastewater not flowing). Source: Christchurch City Council.*

This seismic disruption is not simply material; the physical objects of sanitation are not distinctly separate from the governance of a city or population, meaning that the *temporalities* through which these infrastructures have emerged have also been disrupted. The materialities of sewer network are not just objects of sanitation but *agents* of sanitation which are inseparable from the matters of concern. Inseparable because as objects, when destroyed or damaged to the point of widespread functional interruption, leave a city not only without sanitation but also threatens the particular model of governing which these infrastructures secured and enabled. The breakdown or failure of the sewers renders that which previous to interruption was hidden and unseen to be visible:

> Cultures of normalized and taken-for granted infrastructure use sustain widespread assumptions that urban 'infrastructure' is somehow a material and utterly fixed assemblage of hard technologies embedded stably in place, which is characterized by perfect order, completeness, immanence and internal homogeneity rather than leaky, partial and heterogeneous entities (Graham & Thrift 2007, p.10).

In the wake of the earthquakes the fragility of this materiality, and thus politics, is accentuated. Joyce would agree that any durability attributed to urban infrastructures is an effect of maintenance. It is

this ‘temporary stabilisation’ which largely participates in the process of naturalisation (Joyce 2003), and in terms of the governance of the city, the vast work of maintenance and repair is significant in producing a ‘matter of fact-ness’ of the sanitary services which performed in a predictable, reliable and dependable manner(Joyce 2008). The materiality of rule, in fact, is unstable, volatile, fragile, and in constant need of monitoring, repair, and maintenance. This ‘temporary stabilisation’ is utilised in order to deal with the contingencies of matter (Otter 2002), to fight off decay, to hold at bay the ‘entropic tendency’ of matter (Graham & Thrift 2007, pp.5-6). To fight off decay, to continually deal with the contingencies of matter is also, simultaneously, to hold at bay also the contingencies and fragility of the liberalism which is secured through these large scale engineering projects. Sanitation networks are not just the concern of engineers or city officials. Materiality is maintained, made durable through monitoring, through identifying and locating breaks and damage, management programmes, maintenance workers, welders and fitters, CCTV equipment and operators, drain and pipe cleaning services, scheduled maintenance contracts and ever increasing planning and funding of maintenance, repair, upgrades, and replacement. The work of maintenance and repair, and all that this encompasses, is not only a focus on the qualities and contingencies of matter, but is vital to the enactment and continued existence of liberal governance.

The disruption caused by the earthquakes presents two distinct forms of maintenance and repair. First, that of the everyday temporary stabilisation: the work undertaken to produce the durability of material, that is, the routine and everyday maintenance which is a significant part of the constitution of these infrastructures, the systems, processes, organisations and technologies required to sustain the infrastructures to maintain their functionality. ‘The entire set of means to the means’ (Winner 1977, cited in Matthewman 2011, p.73), the processes, objects, technologies utilised in the vital yet routine maintenance of these large technical systems. The second form of maintenance and repair is the work done to re-configure and stabilise the damaged sanitation networks after the earthquakes struck. This is a different kind of temporary stabilisation in which the objects and technologies, and the durability and reliability of the materials are no longer of primary concern, but rather the very stabilisation of population through the configuration and deployment of other technologies, processes, and objects. This form of temporary stabilisation involves a rush not only to stabilise (and thus govern) a population, a city, but also the very structures of governance which were secured through the maintained functioning of the now ruptured sanitation networks.

The measures taken to establish this temporary stabilisation involved re-configured sanitation infrastructures, improvisations which included: the use of milk tankers and water tanks on street corners to truck in and distribute water to citizens in areas with no water supply; an army desalinisation plant that was mobilised in Brighton (NZPA 2011a); the deployment of thousands of portable toilets in the areas with damaged and interrupted sewers, which also entailed the extensive use of sucker trucks and cleaning teams in order to empty and clean the many 'portaloos' throughout the city; the distribution of over 40,000 chemical toilets to individual households (CCC 2011b) and the deployment of collection tanks in the streets for the emptying of these chemical toilets (figure 11). The sanitation networks are reconfigured: the durability and reliability of the underground structures has failed beyond immediate repair; sewerage lines take the form of trucks, transporting portable toilets around suburbs, moving water, and taking waste from collection tanks to the treatment plant (which was at limited capacity after the earthquake). The 'liberalism' of large scale, anonymous pipes and pumps which afforded sanitary conduct without interference was radically reconfigured. Sanitation, and the health of citizens, became of significant concern to governing authorities. Welfare workers, primarily volunteers organised through the Ministry of Social Development and the Salvation Army, were deployed to every household in Christchurch to monitor and ensure health and wellbeing of residents[7]. Hospitals and health workers became mobilised in suburbs (3news 2011), in order to 'manage' disease, authorities issued health notices and warnings. Things such as hand sanitizer, for example, became an important item showing up at water stations and all manner of public places.

Figure 11: *left a 'portaloo' with collection tank for chemical toilets in background; middle is a collection tank; and right a sucker truck prepares to empty a collection tank on residential street, all in Avonside. Source: personal image collection.*

[7] This was part of my own personal experience as a volunteer where teams made up of building inspectors and Earthquake Commission assessors and a welfare assessor would move door to door and street to street doing assessments. As a welfare assessor there were a number of basic criteria to be assessed and filled out on a survey per household. The Criteria included access to food and water, sanitary conditions and general wellbeing of the residents.

In the months after the February 22nd earthquake temporary sewers were set up in the Eastern suburbs, where the greatest failure of water and wastewater services occurred. This involved portable wastewater pumps and over-ground lines which often pumped untreated sewage directly into the waterways and rivers. The efforts to maintain the urban infrastructures which provide ongoing provision of sanitation to a number of areas within the city still are extremely problematic. The earthquakes have disrupted the very temporalities through which sanitation and of liberal governmentality emerged, with sanitation being re-visited as a problematic of rule, revealing not only the quotidian and prosaic activity of maintenance and repair, but the problematics of governing the city and regulating sanitation. This is especially so in the absence of the historically established means and technologies of affording health and sanitation to citizens. The severe disruption to urban infrastructures, and primarily the city's sewers, means that sanitary conduct became a significant question, central to the political conduct, in the city. This means that the form of liberalism secured through the objects of sanitation is brought into question. What can be seen in the work, the processes and activities of local and central government are both efforts to stabilise, to give durability to material, to repair and replace the objects of, and the temporalities which have come to secure this particular form of governance. The latter involves efforts to re-impose, re-assert governance of the city and the conduct within through the maintenance of the particular techno-social relations which enable and mediate the possibilities of sanitation, possibilities that in post earthquake Christchurch no longer guarantee sanitation as definitively liberal, nor the governance over citizens.

The Christchurch City Council for example, found itself having to publically defend the very deployment of temporary sanitary infrastructures, such as portable toilets, against accusations of supplying the 'rich' with these temporary amenities while neglecting the poorer, lower socio-economic suburbs (Hubbard 2011; NZPA 2011b). Criticisms in the weeks following also surfaced regarding the on-going lack of supply and the sanitary conditions of these portable toilets (Heather 2011). Resistance and tension between those who govern and the population has expanded over a large number of concerns producing multiple criticisms regarding: the speed and level of responses (APNZ 2012); rates and the expected and required levels of services provided (Backhouse 2012; RadioNZ 2012); the readiness to respond to what is a clearly identified threat (CCC 2004; Gorman 2012); the lack of democratic consultation in city decisions (Sachdeva 2012b; Trotter 2012); as well as criticism over the councils responses, and the performance of the elected council and the CEO, which sparked large protests in the city by citizens (Bayer 2012; Gates 2012; Sachdeva 2011,2012a). Relations between citizens, objects and government, relations mediated and secured through objects of sanitation, are

disrupted and re-configured through the earthquakes. In short it is not just sanitation that was damaged in the earthquake but also the *liberalism* which these objects enabled. It is in this sense that the technologies which participate in the constitution of the city are also political. They are technologies that are part of the very mode of governance, they do not determine, nor are they determined by, but emerge as techno-social arrangements which enable, afford, 'help structure what is achievable' (Matthewman 2011, p.90). The durability of materials, achieved through the routine maintenance and repair, along with the specific arrangement and configuration of new sets of objects in order to support and maintain some semblance of urban sanitation helps to effect, to stabilise and secure a particular form of governance over the city and its population. It is in this securing that 'power loses its visibility' (Matthewman 2011, p.71): a particular form of governance is both enabled and becomes imperceptible precisely because it is mobilised in and through particular objects, technical systems. But these objects and technologies participate in the structuring of rule and governance. That is, until such objects and technologies are disrupted, until functioning is interrupted. In Christchurch, sanitation has once again become a matter of concern. Pipes, pump-stations, the means and deployment of sewerage removal and water provision, no longer objects and matters of fact, no longer invisible or imperceptible: a city characterised by the failure of essential services sees, what is normally considered 'objective', 'neutral', and often invisible - supply of sanitation - take on an object-oriented and highly contested political character.

4.3 The state of the city; the state and the city

The change in the material and techno-social relations resulting from the complexity of disruptions caused by earthquakes which have come to characterise Christchurch, have produced the circumstances through which the state, that is the central government, and the city have come into tension. The appearance of the state, in contrast to what has so far been defined as the city, sees the assembling and enactment of different networks and agencies and the reconfiguration and deployment of politics through different devices, processes and apparatus. Problematics of rule, questions regarding how to govern extend beyond the objects of sanitation, beyond the mechanical and digital technologies which enable a sanitary city, beyond the urban infrastructures, and concern the very land itself, the territory of the city and the means and agencies by which such infrastructures and territory are governed. I want to be careful not to ontologise the government, not to think of it as a completely distinct, singular, or inherently natural entity. It is never fully formed but in a constant

process of improvisation, in which the modalities, materials, and socialities are made and remade, constructed, performed and resisted; as are the political rationalities which come into play. Yet simultaneously the state is an 'empirical phenomenon' (Joyce 2008, p.5), it is solid and able to be discerned and its presence in the form of a new agency, CERA, represents an extreme local variation, and one where there is state imposition which comes to overrule local, city, government. It is a reterritorialisation (Deleuze & Guattari 1988)of the city in a way liberalism becomes problematic; in the improvisations of government in response to the effects and controversies emerging out of an earthquake ridden city, liberalism as a technique of rule is both present and absent. In Christchurch there is an appearance of the state or government in the reterritorialisation of the city through the re-configuration of land, the regulation of structures and the re-building of urban infrastructures.

This re-drawing and co-opting of territory, along with uncertainty over the future of the city following the earthquakes, has given rise to multiple controversies that are continuing to break out as the days, weeks and months progress. In this reterritorialisation of the city by the state, there is a far less clear presence of the particular liberalism that Joyce shows in the development of 19th century sanitation. It is in this sense that the maintenance of liberalism is not a consistent, coherent or idealised schemata of rule, where political rationalities are clearly, directly or evenly deployed (or imposed) by a centralised agency. Joyce suggests thinking of the state as 'often myopic, not far seeing, feeling its way precisely in terms of the unforeseen consequences of this dispersal' (Joyce 2003, p.259). It is the 'highly dispersed agency' by which the state comes to be known - not through a centralised institution called 'government' but, as shown historically, as styles of governance which co-emerge with the different forms, programmes, technologies, and objects which come to disperse, enable, transform and resist the exercise of power. The state or government, are to be known and encountered in the very agencies made possible through the deployment of objects through which politics is enacted, performed, encountered and also resisted.

Christchurch is characterised by the uneven deployment of both liberal and anti-liberal approaches to governing the disruptive effects of the earthquakes. These different approaches demonstrate the contradictory and contingent qualities and precarious balance of maintaining freedom/liberalism as a technique of rule, a 'technology' of governmentality. Contingent qualities, it must be re-iterated, precisely because this particular, and historical, form of governance was previously enabled, secured and maintained through the specific processes and configurations of urban infrastructures which have been severely disrupted and damaged by the earthquakes. As has already been briefly discussed, the

establishment of freedom/liberalism that sanitation networks enabled was not a straight or clear path of urban or political evolution. Liberalism is not a 'natural' state of governance or being in the city: it is constructed and tentative; it is contingent, constituted by political rationalities, people, objects and technologies which are configured in certain ways which participate in the ordering of sets of relations with and between such actors. The city and the state manifest as arrangements, techno-social relations, and assemblages. These assemblages are configurations of technologies and people by which freedom as a technology of governance is able to be secured - if only contingently and temporarily. The political rationality of liberalism is performed, maintained and constantly re-visited in these techno-social relations.

It is because liberalism is suspicious of its own efforts to rule that 'free' space is produced as an effect of governance: the state must still be deployed and dispersed, and effect agency, in order to enable the liberal subject - the free, self determining, self regulating, individual - to bring governance to account. It is in this sense that liberal governmentality is constantly creating problematics of rule regarding its own position and actions, questions which are not limited to a 'political' sphere but part of a wider set of relations by which liberal subjects come to perceive any regulation of conduct - be it from city or state - to be an imposition, and thus governmental interference is given critical attention. It is in this conception of the state/government that it is important to look a little wider than sanitation infrastructure to gain a sense of this 'combination of lightness and weight' (Joyce 2008, p.16): a particular projection of distance, and thus an appearance to be 'outside' of society, yet by virtue, also a guarantor and participant in the building of this liberal society. This lightness of being, a state of both absence and presence, is the means by which the governance comes to be known and consolidated. Through the projection of dependability, reliability and predictability, the state appears as an objective reality, that certain arrangements of objects, people, and space enable the government to become *a matter of fact*. I want to briefly consider some of these clusters of bureaucratic powers in terms of the deployment and dispersion of the state through the governing and zoning of land and spaces, the residential rental and insurance markets, and in the rebuild of Christchurch's 'horizontal infrastructure'.

The governance of land

Land is inseparable to the notion of the city and also inseparable from the earthquake. Earthquakes have disrupted land, and furthermore, *the territory of the city*. This disruption moves land out of its place of dependability, reliability or predictability; as with sanitation, land is not an inert object, not a matter of fact, but now an extreme matter of concern. The state, particularly, displays an 'anxiety to govern' this sphere which encompasses not only the land itself but what lies above (structures, buildings roads etc), and that which is below (pipes, sewers, wells, etc). Post earthquake land, and the territory of the city, has become a significant problematic of rule in terms of both the city and the state. The central city following the February 22nd earthquake is an example of this. A manifestation of the state can be seen in the deployment of the army, soldiers in camouflage, swathes of police and patrol cars, blocking access to the central business district (CBD). The state subsists in gates and fences, road cones, blockades, curfews, high visibility vests, police, army, civil defence, and cordons. The state materialises in a multitude of forms and things, reterritorialising the city - the 'heart' of the city - by different agencies, clusters of bureaucracy, acts of parliament and physical objects. The central city, the CBD, was the original site of the historical settlement of Christchurch, has become 'matter out of place' (Douglas 1984): 'It marks the transformation of matter from one state to another, when it becomes threatening because out of its fixed place' (Joyce 2003, p.82). The CBD of Christchurch is no longer a place of free circulation, of movement, of commerce, of consumption, culture or tourism. It is a place of death, of destruction, ruined structures and broken infrastructure; food from restaurants and shops rot, rats re-populate the empty spaces of broken buildings, and quake torn streets. Gardens, verges, and flower beds, once there to beautify, have become overgrown. The CBD, dubbed the 'heart' of Christchurch, now broken, damaged, unsafe, un-flowing. A restricted space, one in which the liberal rationality of freedom *cannot be deployed*: it is red-zoned, closed off.

The state's 'anxiety to govern' (Joyce 2003, p.82) is a desire to re-establish the dependability, reliability and predictability of land through an entire re-mapping of the city: zoning and re-defining land according to the effects of the earthquake; regarding the future use of land and spaces; and the ability to repair damaged land in a cost effective and timely manner (CERA 2011). The very qualities and contingencies of matter – in this case of the land itself - are scrutinised, investigated by scientists and geologists, set against standards, tests, models, future risks, levels of investment needed to rebuild infrastructure, and financial and political implications of decisions made about this land (CERA

2011,2012). The territory of the city in the processes of being zoned is a matter of concern, the land has resisted its 'object-ness' drawing together politicians, public servants, geological surveys, buildings and structures, underground infrastructures, residents, businesses, safety concerns, cost analyses, insurance payouts and acts of parliament. It is the very materiality of land, the contingencies of matter, through which disputes and divisions erupt.

For residential land - the domestic city - the state comes to be known through the re-mapping and zoning of the city (see figure 12). Here the entire domestic city is redefined and reallocated qualities according to colours: Red meaning the land cannot be repaired and thus cannot be built on, and Green [8] meaning the land has been assessed as able to be built on in future. The zoning of the domestic city is a state quarantining of territory, where there is a 'secretive drawing of lines across spaces' (Osborne 1996, p.107). The zoning of land has been understood by citizens as anti-liberal, with repeated calls made to the government to make the process of zoning decisions transparent to the property owners (Barnaby 2012; Smith et al. 2012). In this sense, zoning is political, an imposition of the government which transgresses the freedom of the individual, or more accurately, the freedom of the property owner. The zoning of land as useable (green) or un-useable (red), or currently undecided (orange and white zones) is an intervention which is imposed without recourse or input and demonstrates the manifestation of the state in the re-mapping, the reterritorialisation, of the city. This has been a particular anti-liberal manifestation with both red and green zoning decisions sparking resistance from some property owners (Greenhill 2012; Heather 2012a,b; Smith et al. 2012). While others however, have benefitted from the land buyouts and insurance deals that the zoning has enabled, showing the extremely precarious nature of governance.

A further demonstration of the connection between territory, sanitation and governmentality, can be seen in the way in which the state counters the resistance to zoning decisions by utilising sanitation networks, threatening a lack of investment in the existing infrastructures residing on and under red-zoned land (Cairns 2012; Greenhill & Wright 2011). That is: pipes, sewers, drains, gutters, pump stations etc, will be retracted, left unrepaired, not invested in or extended in these red zoned areas.

[8] Green zones in addition have three technical categories: **Technical Category 1 (TC1, grey)** – future land damage from liquefaction is unlikely. You can use standard foundations for concrete slabs or timber floors; **Technical Category 2 (TC2, yellow)** – minor to moderate land damage from liquefaction is possible in future significant earthquakes. You can use standard timber piled foundations for houses with lightweight cladding and roofing and suspended timber floors or enhanced concrete foundations; **Technical Category 3 (TC3, blue)** – moderate to significant land damage from liquefaction is possible in future large earthquakes. Site-specific geotechnical investigation and specific engineering foundation design is required (CERA 2012).

Figure 12: *left hand image shows the extent of land red zoned as of June 29th 2012; Right hand image is an example of how the boundaries separate properties and streets. Source: CERA (2012).*

The state is co-opting the city's own urban infrastructures, and specifically using the threat of the reduction of these objects of sanitation; in order subdue resistance to the lines and boundaries being drawn, that is, resistance to the state. Says Joyce (2008, p.16): 'what liberalism could not rule by freedom it ruled by other means': the 'weight' of the state to some degree is bearing upon the property owners who resist the political zoning of land, of the city. In this case the 'liberal' infrastructures which have come to dominate and characterise the relation between people and the city are also reterritorialized by the state demonstrating the link between governance and sanitation as a means by which conduct can be shaped and compelled. Citizens and populations rely on these infrastructures, meaning that conduct, sanitary practices, have become normalised through these objects, so much so that it is difficult to imagine the city - the very land of the city and our habitation of this land - in any other way. Resistance from landowners, particularly to red zone classifications, equally draw upon the reliance upon the mediation of objects of sanitation as a means of governance: different imaginaries of city life, where notions of self reliance and self regulation, living 'off the grid', are tapped into, including the suggestion of citizens creating *their own infrastructures* such as wells, solar power, septic tanks etc (Heather 2012d). In this sense a very precisely formed sense of self-governance through objects of sanitation, where the techno-social relations through which a particular liberalism is enabled in regard to city governance, can potentially be utilised and reterritorialized as a means by which 'citizens' *may become free from, or resist,* governance. The importance of sanitation is not merely in regard to health and absence of disease (although this is a vital and essential aspect of it) but involves a very specific form of politics which is enabled through the different and particular configurations of material objects.

It must be noted that CERA opened a short review process (allowing two weeks to apply) for property owners resisting the imposed zoning, however this does not address the zoning decision *per se*, but the consistent application of this zoning: 'A final check will be undertaken to ensure boundary lines are drawn appropriately' (CERA 2012). In this respect the state/government does not problematise zoning, or the reterritorialisation of the city, it simply directs zoning resistance back to the state imposed criteria through which they were originally established.

In the closing off of the CBD and the re-mapping and political zoning of the city, the state manifests a strong and imposing presence rather than a 'lightness of being' (Joyce 2008). Such a presence is doubly reinforced; at once there is a seemingly anti-liberal imposition placed upon citizens through the zoning and re-mapping of land and the city. This is combined with the loss of value of land and property that comes with zoning decisions and the threat of infrastructure withdrawal and the veiled threat of forcible removal (Coleman 2012), as well as the re-territorialisation of the city by the state through this re-drawing of territory. The drawing of such lines across spaces re-configures whole suburbs and areas which at times is seemingly arbitrary: a property boundary, the separation of a street, the colour on a map, can somehow delineate or speak of the extent of earthquake damage, or the state's assessment of that land. A city very much divided and configured by the state, for example there is a separation made between the 'economic city' and the 'domestic city' with a major focus for CERA being on the rebuild of the Central Business District, the central city of Christchurch being understood an economic centre of business. This is contrasted, primarily in the manifestations of the state, the actions and objects mobilised, to the domestic city. This division is one between urban and suburban space, a division through which land and the structures above and below are regulated, performed and configured differently. The tension between the state and the city can be seen in the contention of these bureaucratic clusters such as the state imposed agency CERA, the democratically elected Christchurch City Council, and now yet another governmental agency established – the Christchurch Central Development Unit - to oversee and supervise the design and the rebuild of the city centre, often dubbed the 'heart' of the city, the centre of economic and cultural activity. Yet at the same time residential property owners, those who have been displaced or disadvantaged by the earthquakes are encountering hardships, difficulties and controversies because of the re-mapping of the city, those implicated in the reterritorialisation of the city, the political zoning, are 'left to the market'. The contrasting divisions emerging out the reterritorialisation of the city by the state and the imposition of governance have provoked a plethora of new concerns regarding: the setting and charging of rates by local authorities; the availability of land (and infrastructures) in order to

accommodate the buildings and persons displaced by zoning decisions; financial flows such as government offers on the red zoned houses and land and settlements from both the state run Earthquake Commission (EQC) and private insurers; the affordability and availability of temporary accommodation; and even the abandonment of the very idea of the city centre as a business district (Jones 2011). The next section will focus on this contrasting operation of the separation of the state from the rental and insurance markets which have become key frustrations for residents in Christchurch.

Rental and insurance markets

The residential rental and insurance markets provide an example of the how a particular form of the state emerges through the deployment of markets in order to co-ordinate 'liberal regulation'. The term speaks of a contradiction; liberal regulation could be considered an oxymoron but only when assuming that the 'state' is something distinct from the 'market'. It is this contradiction which is demonstrated in the use of markets as a technique of rule, a liberal governmentality, which contrasts with the seemingly anti-liberal approach whereby the state co-opts and re-territorialises the land and structures of the city as in the previous example.

The separation between the state and the market is a constructed separation by which a particular form of the social is fabricated (Joyce 2008). In this case the market comes to be understood an auto-regulative body in which trade, commerce, buying and selling, can occur outside of, or apart from, the state. It is through this separation, that a 'free' space can be produced in which a sphere of activities can be co-ordinated, regulated and maintained without state intervention. Following the earthquakes there has been both a significant increase in demand for rental property and a decrease in housing stock available for rental (Carville 2012a). The movement in supply and demand is fuelled by two things. First, the earthquakes have rendered some homes unliveable, and a number of areas and suburbs are without, or at least are subject to severely damaged essential services such as water and sewerage. The second factor in this change in the market relates to the activity of the state. There is a shortage in part produced through the zoning of the city and subsequent land and house buyout packages. This buyout package, offered to all property owners whose land has been red zoned, has been initiated by the Canterbury Earthquake Recovery Authority and works within a limited timeframe which stipulates, regardless of the date when property zoning decisions were made, there must be an

acceptance of the offer within 12 months or before 31st March 2013 and the property must be vacated by 30th April 2013. Alongside the zoning of land and the state initiated buyout packages there is: a shortage of land ready or consented for development; a state initiated time pressured increase in demand for rental housing; a sharp increase in rental (and housing) prices; and a lag in both state run EQC and private insurer settlements. Those subjected to the rental market conditions - which is not just displaced property owners but also those displaced due to damaged rental homes as well as the general rental population in Christchurch - are referring to a 'crisis' in the rental market (Berry 2012; Carville 2012a,b). This has prompted calls by the public, the media, politicians and public officials, for the *state to intervene*. In the very request the state has come to be known as outside of or apart from this particular market. Calls for intervention, to which the central government (represented by the earthquake recovery minister Gerry Brownlee), have to date been continually rejected. The 'objectiveness' of the state - that is a transcendence, in which the state comes to be understood as outside society - is maintained in the liberal qualification that the solution is 'best left to the market' (Berry 2012; Carville 2012c). The state has also rejected numerous calls to 'step in' in the case of insurance companies not seen to be delivering expected levels of service and equity in the dealings with earthquake affected claimants.

The state in both cases imposes a form of market liberalism, performing the role as guarantor of a free society based on self regulating market solutions, projecting and maintaining a 'distance' of the state from society. Yet the state remains ever present in a particular form through the deployment and maintenance of this economy of liberal regulation, the state manifesting in the co-ordination of Christchurch's insurance and rental markets. Liberalism, in the rental and insurance markets in post quake Christchurch is re-defined in terms of the economy, using the mechanisms and devices of the rental market and insurance markets to pursue particular objectives. A market in this sense is a mutually constituted set of identities and competencies which renders the buyer/seller (and thus demand/supply) opposition into an equivalent and commensurable arrangement from moment to moment (Callon 1998,1999). Every market utilises different objects, devices, divergent interests, ways of measuring, calculating, and negotiating behaviour, objects, services and qualities; ways of allocating and mutually defining identities and making 'equivalent' the buy/seller opposition. That is, mutually negotiating possible states of the world and ways of acting upon this in relation to the information flows and calculation devices and competencies.

The ‘market’ may progress in general to some degree alongside ‘economic science’ (such as following ‘rules’ of supply and demand for example) but in particular the flows of information, the objects and constituted identities of all the many entities involved, and the means of measurement and calculation draw together into particular sets of relations. Co-ordination of these many entities, competencies and procedures is possible because a market is: ‘the result of disentanglement, framing, internalisation and externalisation’ (Callon 1999, p.192). Meaning that markets are not separate spheres of activity, they are networks in which particular transactions are possible through processes which define and allocate what is relevant and important, how to define and constitute objects and things in order for transaction, how to calculate and negotiate. Markets thus, like sanitation networks, are sets of techno-social relations but also particular relations in which matters of concern come to be co-ordinated through the competencies, objects, technical devices and information flows, in order for calculating agents to enter and exit contracts and transactions.

The liberal state appears as an objective reality which resides outside of economic or free market affairs, thus not imposing or ordering transactions but implying a liberal governmentality of self regulation which can be achieved through markets. The two markets by which the state, in this case, helps to construct, in order to produce a particular ‘liberal’ space are the insurance and rental/housing markets. This is not a case of ‘adding’ (Callon 1999) the state, to these relations - although the state could be understood as subtracting itself - the state is always and already present, and this is a particular liberalism which focuses on markets and utilising the competencies and devices of calculating and negotiating agents, and the relations performed and co-ordinated in such relations. The use of ‘the market’ needs to be understood as a technique of rule which is constructed, performed, produced and re-produced, not in a sphere of activity that is separate but entwined with the agencies and activities of government. In the rental market for example, it is the very zoning of land, and the time limits set on the government buyout packages which are significant in the contribution to rental shortage and price increases. The state is not separate from this market but constructs the very conditions which it is then called upon to alleviate. The state exists in the market conditions yet it also comes to be known as something necessarily separate from them.

In contrast to the ‘rental crisis’, in order for the post earthquake private insurance market to remain functioning in its capacity as auto regulative, the government had to back this market with up to $1 billion ‘bail-out’ package to AMI insurance which held over 30% of the Christchurch residential insurance market (NBR 2011). In this case the liberal state manifests as a guarantor of this free self

regulating market activity through funds - not a direct takeover - which secures the ongoing capacity of the insurer settle claims. The conditions of the insurance market however have also been directly altered through the legislative changes made to the Department of Building and Housing Guidelines (DBH 2011). These were changes initiated by the government through parliamentary legislation in order to ease the building guidelines for repairs to quake damaged homes. Such changes however had the effect of enabling the private insurance market to *re-calculate and renegotiate* the value of earthquake damaged homes. Meaning that homes and buildings deemed write-offs previous to the legislative changes, were reassessed as repairable. This has led to a re-evaluation of insurance claims which are considerably lower than first estimated and causing dissatisfaction and economic disadvantage to property owners (Heather 2012c). Here the legislative changes initiated by the state in order to ease building guidelines for repairing homes in Canterbury - a government improvisation intended to speed up and make rebuilding easier - produced changes in the conditions under which the calculating and negotiating of settlements by private insurance companies are undertaken.

The utilisation of the market is a technique of rule, a liberal technology by which the state appears at a distance, outside of, the activity of the market. In the brief examples above it can be seen, however, that the market and the state are not separate spheres, but are intimately entangled. The state manifests in market conditions facilitating and producing effects to which householders, property owners and private insurance companies react and respond. The example also provides a contrast in approach and important distinction between 'private' and 'public' ownership. The land being re-zoned, entangled with insurance, and the structures embroiled in these controversies are privately owned - the government must in this sense operate through the market: the state alone does not construct the conditions of the market, the improvisation and manifestation of the state is also co-ordinated through the market in order to effect governmentally legislated solutions to natural disaster. Here the agency of the state itself is regulated, and supports, if not a clear liberalism, a liberal inclination. 'Public' ownership however, such as in the case of Christchurch's sanitation infrastructures, comes to be approached in a distinctly different manner through which objects such as pipes, drains, sewers, etc, participate in the coordination of relations. The performance of liberalism is far more obscured, as the very objects of sanitation for instance are, and thus distance is enabled through the very specific configuration of objects. The difference between the public and private models in practice means there are different forms of liberal (and anti-liberal) politics as mediated with and through individuals and populations, programmes, institutions, devices, technologies, and the objects that participate in the formation, maintenance and the resistance to the specific

enactments of governmentality. This also emphasises the centrality of focus on matters of concern, where the political is out worked in the very disputes, divisions, controversies which are gatherings around specific things. This difference in approach with regard to objects and the appeal to a self regulating and separated market, and the manifestation of the state/government, can be seen from another angle when turning back to the rebuilding of 'horizontal infrastructure'.

Rebuilding 'horizontal infrastructure'

The Stronger Christchurch Infrastructure Rebuild Team (SCIRT) is a means to govern the extensive repair and rebuild of Christchurch's infrastructure and the very significant set of problems associated with disrupted and damaged infrastructures throughout the city. The SCIRT alliance takes the form of a 'contractual agreement between multiple parties created to align all participants to common goals and objectives' (SCIRT 2012). This is an alliance through which commercial entities, which normally may act in competition in the market, are brought into a co-operative alliance in order to collectively work together in designing, implementation and co-ordination of the rebuild of the water, storm-water, wastewater, and road networks of Christchurch. The state is positioned as co-ordinator and allocator of contracts and in fact initiates and produces this contractual agreement.

The conditions created through this alliance are significantly different from the manifestation of the state in relation to the rental and insurance markets. The liberal regulation deployed through the use of 'the market' - by which the state comes to demonstrate a particular separation from market activity - in the instance of the SCIRT alliance there is a *blurring of the boundary between the state and private contractors*. The only outward differentiation made (which certainly has implications regarding roles) is between 'owner-participants' and 'non-owner participants'. The owner participants are allocated state agencies: CERA (Canterbury Earthquake Recovery Authority), the NZTA (New Zealand Transport Agency), and the CCC (Christchurch City Council). Of the three agencies the CCC represents and acts for the affairs of the city and owns the bulk of the infrastructure that is being included in the SCIRT alliance works programme: the water (1500 km of pipelines, 54 pump stations, 167 wells and 34 reservoirs), wastewater (1700 km of pipeline, 120 pump-stations, 33 odour control sites and treatment plant) and storm-water networks and approximately 2,300 km of local roads (NZTA 2010). Curiously, CERA technically is not an 'owner' of any existing infrastructures but takes a leading role in the re-construction of the city's essential services and infrastructures. This is another form of re-

territorialisation of the city by the state demonstrating a desire to remain in control of the funds that will, literally, be sunk into the city - an estimated $2-3 billion (SCIRT 2012) making it one of the biggest infrastructure projects in New Zealand - and the ownership that such funds bring in this rebuild.

The state comes to be known in the capacity to structure the relations between the city, certain clusters of bureaucracy, private contractors, land and objects; the state subsists in the very conditions of the infrastructure rebuild, conditions which do not emphasise separation between the market and the state, but a merging and co-ordination of the relations between private and public entities. The very qualities of commercial, competitive, and free, self-regulating markets which have been established and deployed in relation to the rental and insurance markets are *at the very same time in the very same territory*, with the SCIRT alliance, suspended. That is, the liberalism deployed as a technique of rule is simultaneously present and absent; that is the precarious balance of the 'lightness of being' in which the state can be both present, but not necessarily felt, not necessarily oppressive in the imposing, exercising or dispersion of governance. However the weight of the state, in some circumstances, can most certainly be felt and enforced through the mechanisms, technologies, programmes, objects through which its agency is secured and outplayed. The state comes to subsist in the very conditions by which its dispersion is seemingly objective and separate. It is known through the objects and technologies which mediate relations between government, city and individual. It is known in its role as a guarantor of freedom, and in its 'distance' from the social witnessed through appeals to non-intervention. But simultaneously the state can be found in the conditions which remove this separation or suspend and intervene in the processes of the free, auto-regulative and calculative capacities of markets, of citizenry and of freedom of movement, of ownership, and space.

This emphasises that liberalism is a construct, a technique of rule that is deployed. And furthermore, that it is deployed not as a direct entailment of a particular liberal political rationality in which politics takes the form of exclusively person oriented representation, but in relation to the objects and relations which they enable and afford. Objects become central to the matters of concern, they give form to politics: there is a participation in the forming, the securing, and resisting of political rationalities. It is here that we can turn full circle back to the point that we began with. That is, the movement of matters of fact to matters of concern. By looking at the deployment of liberalism as a technique of rule, a particular governmental technology: a politics of things emerges, a politics not separate from humans, but entangled and enmeshed, in which a state, a city, an infrastructure is deployed and formed, encountered and secured, resisted and reterritorialized. In Christchurch,

following the earthquakes, there has been a gathering around objects; objects that through seismic activity became things, matters of concern, a coming together which is characterised by division. This brings into relief, disrupts and reconfigures a politics that is built into, constituted by, and secured through these black boxes of urban infrastructures and the land in which they are situated.

Chapter 5

Romantic and baroque: concluding observations

I am holding some resistance toward concluding this document, or to put it better, to concluding it in a particular romantic manner. There are four accounts, each is different from the other, and each offers a number of different viewpoints, ways of exploring and seeing the city and infrastructures. Each of these accounts is not necessarily assimilable, not reducible. These accounts are not intended to be 'settled' in a zero sum type of formula in which a final smooth, coherent or overarching set of conclusions can be offered. In this final chapter I want to gesture towards the baroque conception of non-coherence, of multiple viewpoints, and resistance to an overview. I want to look at the contrast of the romantic and baroque sensibilities as a means to finish, to (provisionally) end, this document. Following Chunglin Kwa (2002), John Law (2004b, p.24) concisely contrasts the baroque and the romantic sensibilities in the following list which provides an immediate sense of the differences between these sensibilities:

Romantic	***Baroque***
Looking up	Looking down
Complexity emergent	Complexity within
Complexity big	Complexity small
Holism	noncoherence
Making explicit	Accepting implicit
Homogeneity	Heterogeneity
Abstraction	Specificity, Sensuousness
Centring view	No overview

One must bear in mind, first of all, that this contrast is a convenience: ideal types constructed specifically to explore the different ways of 'imagining complexity, size and the character of inquiry' (ibid, p.24). The point being not to claim that this list is necessarily definitive but provides a 'limited coherence' in order to contrast the two styles. This is especially so for what is shown to be the baroque because, firstly, it is claimed that the natural sciences predominantly tends toward that which is more romantic in style (Kwa 2002), and also to a significant degree, so too the 'contemporary academy' and specifically the social sciences (Law 2011). And second, because the very 'nature' of baroque is contested, slippery, and resistant to abstraction. Law suggests that there are many

baroques and thus it would be more productive to ask limited questions which consider the baroque as sets of techniques through which to learn new ways of understanding realities and imagining complexities which bring new ways doing empirical research, new conditions of possibility for social science (Law 2004b,2011). In this respect the intention is not to look at the set of accounts which I have offered in this document, as necessarily romantic or baroque *in toto*, precisely because aspects of both can be exhibited; there is always space in-between these categories and there are many versions and many ways and effects produced. I want to resist producing a smooth set of accounts, to reducing these accounts to a summation, a number of points; a resistance to settle that which is unsettled. How to end then? To conclude, in respect to this document, will be a consideration of the differences in these sensibilities, looking loosely at the characterisations from the list in relation to aspects of the romantic and baroque present in the previous four chapters.

Chapter one began by building a type of social scientific laboratory, in order to investigate a specific set of objects. This chapter was less about plotting a course forward or locking in any particular method or theory, than about looking at the difficult and complex terrain and the problems and tensions which it holds. This first account then regarded the process, or at least a partial account of methodological and conceptual processes which contributed to the multiple paths which this document proceeded to take. The construction of a social scientific laboratory which is risky and sensitive to the object of inquiry, a laboratory which regarded the problematics of how to go about imagining and inquiring of Christchurch's urban infrastructures. What are they? How, as a social scientist, am I to observe these objects of inquiry? How to describe what is observed? That is, how are things made visible?

Of course, I had much help from others that have gone before, have faced such questions in various ways and are far wiser than I: Bruno Latour, Giles Deleuze, John Law, Nigel Thrift, to name a few - not to mention the ever present but invisible guidance and wisdom of my supervisors. The first chapter was also helped along by the notion of visuality and visibility offered by Andrea Brighenti (2010). Chapter one was a consideration of the social science laboratory, of the apparatus of the sociologist, and of the ways in which worlds are rendered visible and described in particular ways. There is a 'double social life of methods' in which the world and descriptions of the world are not easily separable or distinct realms but are folded into each other. Isabelle Stengers and Vinciane Despret appeared briefly to remind us of the possibilities and politics of the scientific through the construction of risk. It was argued that increasing the opportunities to maximise risk in social science will in fact give

the discipline a greater ability to navigate through what Savage and Burrows see as a crisis - in terms of method, but also conceptually - for contemporary sociology.

There is a certain baroque uncomfortablness that characterises this chapter. The sense that the research cannot be plotted neatly before-hand, that method and theory are not separate realms or divisions of labour, and that the work of the social scientist is pervaded by problematics associated with method and description. This was expressed to some degree in the characterising of this project in terms of the work of observation and description, in which the two notions are folded together (Law 2011), and that doing research is an encountering through which concepts take on a creative, a productive capacity, a pedagogy (Deleuze & Guattari 1994). It is in the *specificity* of the particular encounter through which observation and description are able to be constituted. The chapter began with a sense of *heterogeneity* in which the Christchurch wastewater network at once occupies many different forms, is constituted by many different objects, processes, entities and artefacts, and that these variegated heterogeneous elements are not reducible to one another, not reducible into one 'system' or 'network'. These are tensions which cannot necessarily be resolved, and a number of problematics regarding how to put together research could not be engaged without entering the field, encountering the object of inquiry, and attempting to narrate and describe this process.

Chapter two moved to the coalface of these tensions introduced in chapter one. This project has taken on a particular object of enquiry, Christchurch's sanitary sewers, something that is considered to be large - not only in material form as a vast system of pipes and pump-stations that span a large area of land, but also in complexity, in the needs of a city, in the interconnection of services, in how it is maintained and operated. It is this large scale which would be deemed relevant, pivotal, to how to go about any description and analysis in this project. John Law (2004b, p.13) asks: what is it to be big? What is it to be small? And what is it to be global? This is a question regarding scale, and how we move between and understand scale and complexity. The romantic sensibility is to 'look up' to see the emergent whole (Kwa 2002; Law 2004b), to get an overview, to see the global, the big picture, to see in large scale and in wholes, and from there work down, add to the picture, render connections, and relations of components explicitly.

The object of inquiry is encountered through empirical observation in the *Christchurch City Council Water and Waste Unit* control room. The problematics regarding the regime of visibility involved in social science in chapter one are juxtaposed with the work in the control room which renders a city

visible. A shift controller, sitting in front of screens, is able to monitor buried pipes, over and underground pump-stations, wells, reservoirs, the perpetual flow of water and effluent, all covering a vast area - made visible in this one room, as images and flows of data on screens. But what is introduced here as 'the city' is not taken as a given in this research: the question remains, what is being seen? The control room itself demonstrates a romantic sensibility: the 'city' is an emergent, but explicit whole, greater than the sum of the parts, something that is abstract but also rendered visible. This is why this term remained bracketed continually throughout the document: it is a romantic shorthand, a romantic metaphor (Kwa 2002) for the vast and variegated processes, practices and heterogeneous entities which populate this realm. 'The city' does not explain the presence of sanitation, but rather needs explaining. It is in this respect that the methodology took on a following, one which could not necessarily separate this 'city' from the processes, objects, and practices of sanitation. The 'city' as a method of exploration or analysis obscures detail in favour of large scale understandings. It is the detail - in 'looking down' - regarding how the 'city' comes to appear on screens, centralised in one room that became important. The empirical observations here were informed by a baroque tendency toward detail rather than the overview, looking down, finding complexity within, in the form of following objects and actions. Describing the very encounter with the city in the control room was articulated as *looking away*. This referred to a rejection of the 'global' view, a rejection of the notion that it was possible to see the city in its entirety. Looking away is the articulation of the partiality of views, that the city is a particular achievement of visibility accessible only through the processes of loss and gain, achieved through associations with objects, humans and technologies, which transform and mediate the possibilities of vision.

In this control room 'the city' culminated in six screens before one person. The city is a movement of traces, detail is lost, but there is also gain: a number of vast and interconnected physical urban infrastructures, made up of many individual components, are able to be collapsed together, viewed simultaneously, monitored and controlled - a sort of pragmatic romanticism which in fact adds to the capacities, add to and participates in the constitution of the realities of the city. This 'city' is also encountered and experienced through a distributed sentience, enabled in part through the digital and informational technologies which render the city visible. Donna Haraway (1991) and Deleuze & Guattari (1988) - thinkers themselves who are influenced by the baroque - help to explore this body/machine/computer configuration, in which the concepts of the *cyborg* and *becoming* participate in vocabulary in order to articulate a specific merging of human and non-human in which there is a reconfiguring and distribution of sentience which connects and extends both human and non-human.

The shift controllers respond to the complex and vast networks in ways which intimately connect them with the objects and data. The complexity of this encounter is not found in a necessarily overarching view but in the small detail of the very work, the very objects, the *complexity is found within detail,* as opposed to the romantic imagining of complexity which is sought in the global, the broad, overarching view.

As I provided an account of the visibilities accessed *in* the control room, so am I producing a set of visibilities *of* the control room, in which the laboratory of social science is not seen as separate from the control room encounters. There is a constant folding or a displacement between what constitutes the inside and the outside, the research and the object, the observation and the description, all folded together. The participants and the processes of empirical research are woven together in a way that does not separate these entities. This produces ironies and tensions that are not necessarily comfortable, but neither are they wholly romantic or baroque. There is an intermixing of the abstract and specificity, the drawing upon existing concepts but also the adaption and re-working of them in the material and embodied encounter in the research process.

It was in the control room that I was introduced to a number of versions of the city, leading to the focus in chapter two on how this city comes to be seen, sensed and known in the specificity of this particular place and fieldwork encounter. However the control room is the only place that 'the city' can be observed as an entirety, as a coherent whole. Scale in the romantic imagination is a question of size, of large and small. It considers emergent wholes, and the assumption that the whole is greater than the sum of its parts or components. The romantic pushes toward what is a whole, the global, the entirety, abstractions: that the 'city', or 'sanitation', or the 'wastewater network', is a 'reality in its own right which emerges as a result of the interconnectedness of its component parts' (Law 2004b, p.15). That is, in the control room the 'wastewater network' is a series of connected components, catchments, pump stations, laterals, mains and trunk sewers, all converging to a centralised point – the wastewater treatment plant, where the control room is situated.

For the baroque, however, the world does not lie in the emergent whole, in which complexity is added and made explicit in the form of components and their relations. The world for the baroque lies in the detail. Chapter three explores the 'city' found in the control room, by seeking how it correlates with sanitation, with the movement and circulation or effluent. That is, exploring the correspondences to these screens in the control room rather than the abstractions and constructions of scale offered by

them. Chapter three is an attempt to search out and follow the networks of the city, to use a baroque imagination to 'look down', to explore the city in its empirical and material detail. There is a sense of baroque *sensuousness* in the descriptions of the fieldwork, a movement from something that is routinely mundane to something that is different, mysterious, and irreducible. This is a sense that is related to my own subjectivities and emotions, the sensuousness and embodied experiences which arose out of the fieldwork encounters.

These were encounters which were seeking to explore how the city is constituted through the very objects which perform sanitation along with how the disruption by earthquakes reconfigures these objects, the city, and sanitation. This approach meant that the objects of sanitation are the objects of inquiry and the underlying methodological questions in this chapter concerned how, outside of the control room, to actually observe and understand these networks. The laboratory of social science which remained overtly present in the account of the control room, takes the form of the concept of the *sanitation unconscious* - a concept adapted from the ideas of Nigel Thrifts' (2004b) 'technological unconscious' - to explore the ordering of urban space performed through the establishment of sanitation and the collective and individual practices that are reciprocally formed through the relations between bodies, objects, technologies. The world of the city, of urban space and sanitation is one which occurs in the everyday, in which the body, the senses and experience are intimately implicated in this world, as are digital technologies, hydrological cycles, physical objects, and the circulation and movement are folded into the production of sanitised urban space. Part of the baroque is heterogeneity, including material heterogeneity, but it is here also that the concept of the sanitation unconscious is mobilised to attempt to account for sanitation in a different register, a particular construction of the unconscious in which embodiment and distributed action are implicated.

It is in this sense that the sanitation is explored as both big and small: it occurs and is constituted and performed in the minute and intimate spaces and places of individual practices and experience yet simultaneously involved in the production of cities, of urban and sub-urban space, as something which mediates the natural environment across vast spaces and areas. What emerges and is made explicit in the control room is a series of linear relations between sanitation performing objects which form coherent networks, and thus the city emerges out of the explicit relations between and across these infrastructures. But the city is also found by looking down, in the detail. Chapter three moves across and in and out of different scales, the city as space, as infrastructural networks, as large but also in the configurations and assemblages of individual practices in which bodies and senses are reconfigured

through the processes of sanitation. It is in this sense that this chapter constructs scale as part of a particular means of visibility. Such use of scale in this context sits 'in between' romantic and baroque inhabiting aspects of both sensibilities. The romantic remains committed to the overview, the global, and the allocation and divisions of large and small, through which relations and connections can be articulated, added and made explicit. For the baroque, however, scale and size, is an achievement rather than a given (Latour 2005b; Law 2004b).

Chapter four is different again. The construction of scale here detaches the author - integral to the previous accounts - and the questions regarding the process of visibility. The result in this final chapter is an overarching 'view' across temporalities and spaces, able to direct vision toward relations between sanitation and the city, relations between things such as land, markets, contracts, and the constitution of the state in and through the relations of these things. When placed alongside the previous chapters, this implicitly demonstrates how this document and the visibilities that are presented are constituted through various constructions of scale. Previous to this chapter the processes involved in the constitution of visuality were implicated in the very production of the descriptions. This chapter builds scale differently, producing what Donna Haraway (1991, p.189) would call the 'god trick of seeing everything from nowhere': the city, the state, politics and the objects embroiled in this chapter come to be un-problematically viewed from, indeed, nowhere. Here the regime of visibility is detached from the question of empirical vision which is present in the previous chapters. However, the use and construction of scales and folding are part of this visibility when the chapters are knitted together - the differences do not necessarily provide a coherence but exemplifies the tension and the interplay of the romantic and baroque sensibilities.

In this instance the 'view from nowhere' implicitly communicates a distance, a particular transcendence which looks to the political construction of sanitation, how particular configurations of objects, and processes afford a particular form of liberalism which is connected to governmentality but is not independent of but affected through the specific assemblages of material objects. This section moves across temporalities where sanitation in the 19th century emerges as a particular set of liberal techno-social solutions - a re-worked historical narrative offered by Patrick Joyce (2003,2008) - drawing explicit lines with the contemporary case of Christchurch's post earthquake, disrupted infrastructures, and the manifestations of the city and the state or government through the zoning of land, the construction of rental and insurance markets and the conditions of the SCIRT alliance.

This is also an argument regarding objects, not as independent, clearly delineated matters of fact but objects as matters of concern around and through which politics emerges and is built. Sanitation is a matter of concern: in the 19th century it emerged as a particular liberal techno-social solution: in post earthquake Christchurch it is a matter of concern where objects of sanitation are contested, resistant, and continually added to and reconfigured. The argument follows that the seismic disruption unearthed the temporalities and object arrangements through which liberal politics was able to be secured. Sanitation, or more precisely the objects of sanitation reside at the core of what we know as politics, albeit, a politics which often renders these very things silent or inert. In this case of post earthquake Christchurch, liberalism as a technique of rule or governance, is thrown into dispute and disarray precisely because the realm of politics is not separate from the realm of objects.

The scale utilised in this chapter can be implicated as both romantic and baroque because, as already shown, the section alone takes a particularly large scale and overarching view. A visibility which is presented unproblematically and in a significantly different way from the encountering described in chapters two and three. But it is in the juxtaposition of the chapters where the constructions of each version or the regimes of visibility are all thrown into relief. Playing off and reciprocally emphasising the differences and viewpoints that each chapter presents. The question of scale has never been completely dissolved or dissipated in this thesis. I have moved across scales and temporalities, looked up and down, focussed in and out of detail. At times, such as chapter two and three, the author and the social scientific laboratory has been present, in chapter four however, these aspects are absent. Each chapter looks at something different, in a different way, using different concepts and vocabulary. In this respect, what this document presents is a *visibility of visibilities*, an overview of numerous viewpoints which are not separated from the (partial) processes of their own construction. Each chapter, as part of a set of visibilities, 'partial connections' (Strathern 2004) interlinked to the others - the chapters are ordered, the viewpoints correspond, as much through difference any similarity. Together they provide a description, or a number of specific descriptions which are related but not necessarily subject to, specific materialities and embodiments of knowing, concepts, processes, objects.

A second point to be added in relation to this document as a visibility of visibilities: the stitching together, the content, the language, the words - that is, to write, is to collude (Law 2004b, p.25), a collusion which does not simply involves words. Writing is mediation, the very act of writing is itself distributed across and through genres, narratives, formats, ways of presenting, ways of constructing

and articulating scale and size. These are regimes of visibility themselves through which the words and meanings are mediated, altered and configured. Chapters are constructed and moved about, there are deletions and additions, versions and re-writings, references are cited, descriptions squeezed into words, objects translated and inscribed, experiences and encounters given vocabulary, concepts adapted and re-thought, and in turn adapting and reconfiguring the very phenomenon which they are being used to describe. Complexity lies here also, in the detail or writing, and ultimately presenting, making things visible through the medium of words.

Final words

How am I to bring this document to an end? This is the crux of my resistance: this document, the chapters within it, are a set of visibilities which do not necessarily fit together in order to produce a coherent, neat or smooth overall account. Each chapter has a number of viewpoints, each imagines complexity differently, describes and articulates its objects of inquiry in a different manner. The reason for ending this document in such a way is because each account is different, each can be seen as separate and not reducible to the others, but also intimately connected. Each account provides a different set of visibilities, a different set of viewpoints which can at times cross over, while at places can greatly diverge. It is the very point that each chapter has been a means to 'partially connect' (Strathern 2004) the city, sanitation, sewers, to make them visible, to multiply viewpoints and complexity. It is counter intuitive, at this point, to 'settle' these accounts, to close them back up, to sum up, to conclude them, to end.

What is an end? An ending here is a convention, a necessity that is imposed from academic requirements, word limits, educational regulations, as well as personal relief. This document will take its place on a shelf, will be translated into a grade, attached to the rewarding of a Masters degree, implant itself, hopefully, in the thoughts of its readers, it may even be re-worked into a publishable article. So maybe the writing will stop, but all does not cease and go black at the termination of these words: the wells will continue to draw water, the pumps will continue to circulate liquids, the sewage, the effluent of populations will continue to flow, the controversies will continue to erupt, politics continues to settle and divide, rework and reconfigure. Shift controllers will continue to sit in front of screens, data will continue streaming and accumulating, cyborgs will not stop proliferating.

At the very beginning I invited you, the reader, to join this journey, to take part, and to also resist your reduction to a mere marker. I suggested that our journeys through this thesis are qualitatively different, and for that reason this document is a mediator of worlds. Not just between a student and a professor, not just of an academic convention, but also the worlds of objects that have been translated and inscribed here, encounters and experiences, concepts and thoughts, oriented around references, authors, other thinkers. This thesis has been an exploration of the realities of wastewater, but these networks stretch further than the underground lattice work of pipes, further than the boundaries of a city. But the romanticism of scale misleads, there is a cascading simultaneously inwards and outwards, a continuous folding. At once this document itself is a whole world in which the weight and silent force of many things press against the claimed author. Yes this document is a world, a contract that binds many together, if only provisionally. And what of authorship? Of course my name appears on the document, and the grade will be associated with this name. But in name only am I the same. The process: the journey in this world, the exploration of Christchurch's sewer networks and infrastructures, in the books and articles read, the people met, the objects observed, the networks of associations forged in the construction and writing of a thesis. This process of assembling a world now populates me.

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